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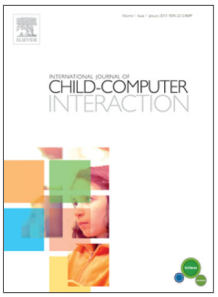

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Children's Design Recommendations for Online Safety Education

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Abstract

Ever younger children have their personal life online and there are worries of their online safety. To understand how children engage with and perceive online safety education targeted at them we arranged workshops with 11-12-year-old children who engaged with three existing educational packages for online safety targeted at children and brainstormed design recommendations for future education. We report the results of the workshops and further analyze the results using the lens of Schwartz's theory of basic human values. Based on the analysis, we recommend that child-computer interaction designers and practitioners of online safety education acknowledge the following when developing educational packages on online safety for children's use: considering both children's and educators' objectives and related values; integrating aspects of children's own media culture; including more concrete advice; having a positive tone; and, engaging both children and teachers in the design and evaluation.

Keywords: Online safety; Cyber safety; Children; Web 2.0; Internet; Education; Safety mediation; Teachers; Schools

1. Introduction

It is typical of teenagers to join, use, and leave different Internet and social media services with growing speed and fluency [1], but in recent years there has also been an increase in the Internet usage by younger children [2]. Being always online and reachable by peers has become routine [3], and children are increasingly surfing the web with their mobile devices [4]. The Internet and mobile technologies certainly provide vast opportunities to learn, create identities, and to participate [3, 5], but at the same time children's online activities are becoming more private and inaccessible to parental oversight [6]. Adolescence is characterized by heightened risk-taking and independence from parents and these tendencies seem to be magnified by the opportunities afforded through online interactions [7]. Hence, it is quite understandable that adults are afraid for children, the things to which they might be exposed and the harm they might end up in [8].

Fast adoption of the Internet and online technologies presents industry, researchers, policy makers, and governments the task of recognizing the risks of Internet use and developing strategies and tools, i.e., mediation mechanisms, to ensure that harm associated with the risks is minimized [9, 10]. Parents, schools, and other children are also involved in a practical way in seeking to maximize online opportunities while

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minimizing risk of harm [11, 12]. To help with this hands-on online safety mediation, various national and international actors have developed different kinds of educational packages that include for example guidebooks for parents [13, 14] and teachers [15] and educational games for children. However, with a large amount of different educational packages available online, teachers report that it is difficult to select the best, most up to date pieces [16, 17]. Furthermore, there is a lack of independent evaluations concerning what kind of online safety packages and interventions are effective: Many take place, but little is known of what works, when or why. Because of this, new education will likely fail to learn from the mistakes of previous ones [9]. Building new knowledge, exploring new paths for cooperation for example with industry, and co-creating child-centered solutions with children themselves [10] are needed. Overall, children should be involved in matters concerning their own life [18], and we believe that researchers in the area of Child-Computer Interaction (CCI) are particularly well equipped to contribute here: by involving children themselves in the development of online safety education for children, in order to produce such education that truly engages them.

There already is a growing interest in the topic of children's online safety in CCI and Human-Computer Interaction (HCI) research, papers reporting for example parental [19, 20] and societal [12, 21] concerns, children's risky actions [1] as well as means by which online risks could be mitigated [22-24] and solutions for preventing certain kind of online behavior [22, 25]. There are also numerous examples of participative design with children addressing their education, papers reporting collaboration with children for example in the design [26-29] and evaluation [30] of educational games, and evaluating children's engagement with these games [31]. Collaboration is seen to improve the quality of the solutions as well as giving a democratic possibility for people who are affected by the decisions to influence design [32]. In CCI research it is emphasized that while we might be experts in our field, children are necessary participants when we are designing for them, as our memories fail us and we cannot remember the nuances of what it means to be a child; hence, children of today are the experts at being children [33]. Furthermore, even if we could remember what it was like, children's contemporary media landscape is far different from what we encountered as children [33].

More research has been called for younger children regarding their online safety [9, 34, 35]. It has been argued that researching Internet use among children under 12 years old should be made a priority [36], as it might be that they do not have the capacity to act online in a safe manner [2, 36]. Further research with these younger children could also help to inform the development of future educational strategies for schools, parents, and young people [7]. We therefore conducted a study with Finnish primary school children (10-12 years) and their teachers. In our study, the children acted as informants, engaging with three different educational packages for online safety targeted at children and schools, and brainstormed design recommendations for future education. With the term "educational package" we refer to materials available for teachers' use. They are complex educational ensembles that encapsulate educational material, related learning and teaching tasks carried out, and underlying pedagogical design. We chose that term to simplify the terminology used in the paper, to show that our study was an intervention to normal school work, and to emphasize that our expertise is not in developing teaching methods or pedagogical design, instead our goal is to allow children to voice their opinions and views on issues that concern their lives. As our research question we ask: *how do children engage with and perceive online safety education targeted at them and what kind of design recommendations do children offer for the development of such education?* In this research, we do not try to objectively measure the effectiveness of the education. Rather, we aim for empathic understanding of children in relation to online safety education.

The contribution of our paper to the CCI community lies in inviting children to develop their online safety education through qualitative, exploratory research that provides initial insights for the further development of such education. We inquire children's own views, issues, interests, and opinions – hence, personal

viewpoints and experiences are accounted for. Particularly we analyze values underlying and shaping children's views, issues and opinions. Values are significant in motivating our action and they function as standards for judging and justifying our action [37, 38] The importance of values shaping and underlying technology design and use has already been widely acknowledged in HCI field and in the CCI community as well (e.g. [25, 39-42]), while so far research examining values among children is very limited. We believe that to truly understand what kind of online safety education works, when it works or why it works, it is important to consider why children might have a certain opinion concerning an educational package; what their underlying motivations and values are. This helps in the creation of such kind of educational material that interests, motivates and resonates with children. In this paper, inspired by earlier work, we acknowledge and identify values underlying children's opinions and design recommendations as regards to their online safety education.

Next, we discuss related research on children and online safety as well as on values. This is followed by introducing our research design and the limitations of the study. Then our results are outlined, and finally the implications of our results are discussed together with paths for future work.

2. Related work

2.1. Online safety

The widespread adoption of social media and other networked technologies has prompted concerns about threats children face when they go online [8]. A threat is defined as something that can intentionally or accidentally exploit an existing vulnerability and cause some harm. Harm is a distinct and negative outcome, whether measured objectively or, through subjective self-report. A risk is a calculation based on probability and the consequences of harm, when exposed to a threat. [3]. For example, there is a risk that when encountering some violent or sexual content online [3] children might experience psychological harm [8].

The threats associated with children's Internet use are usually seen to include content threats and contact threats. Content threats include spam, targeted emails/ads, pornography, violent content, pro-anorexia content and drug related content, while contact threats include grooming, sexting, cyberbullying, cyber stalking, and privacy loss [43]. boyd and Hargittai [8] extend this categorization to include conduct threats such as child being engaged in, e.g., illegal file sharing or bullying others. Magkos et al. [43] extend it to include also threats specifically related to computers and Internet use, namely information security threats such as malware, phishing, data theft/loss, password stealing/cracking, and Internet addiction. These threaten information security (i.e., protecting private information and systems from unauthorized access, use, disclosure, disruption, modification, or destruction [44]), and personal safety (i.e., ability to go about their everyday life without threats or fear of psychological, emotional or physical harm [45]). Online safety can thus be defined as protecting a person's physical and psychological safety, as well as their reputation, identity, and property online [46], property including hardware, software, information, and intellectual property.

2.2. Online safety mediation

Mediating children's online safety is an issue that requires teamwork from many parties, for example the industry, policy makers, schools, different authorities, and researchers working in related fields [10, 47]. Friends, teachers, and parents are involved at grass-roots level [12, 47, 48]. In line with [49], we use the term "mediation" to describe the strategies used to manage children's Internet use hoping to maximize the advantages and to minimize the possibility of harm.

The most important method for *industry mediation* is use of age limits. There are some social media such as Momio, Club penguin, and Habbo targeted for young children but for example Instagram or Facebook set their age limit to 13. Service providers rely on users' self-professed age, however [50]. The industry also applies mechanisms to screen off offensive content, such as keyword blacklists or offering users possibility to report offensive content. Most social media, however, use a lexicon-based automatic filtering approach that is not very accurate and might generate many false positive alerts [51]. In addition, when these systems depend on users or administrators to detect and report offensive content, they might fail to take quick actions. For children who often lack cognitive awareness of risks these approaches are not effective either [51]. Most services also have different privacy policies and settings available [52], but the settings have been criticized for having too weak defaults for their younger users [2] and the privacy policies for being generally vague or non-transparent [52].

Different *social mediation* strategies employed for reducing the risks that children face online include active mediation of child's Internet use (talking to children and offering help), restricting it, or monitoring it (checking profiles on a social networking site, or messages etc.). *Technical mediation* can be seen as an extension to social mediation in a sense that a parent or a guardian can install an application to a child's computer or phone for virus protection or prevention of risks [23] by filtering and restricting unwanted use. Those have been criticized for not being very good in blocking non-English language content and for a tradeoff between underblocking (permitting sites that should be blocked) and overblocking (blocking sites that should be permitted). There are also some ethical considerations: although law might give the parents grounds to monitor their children online to keep them safe it should still be asked if it is ethically acceptable. [43]

There are also different *policies and educational efforts* underway in many countries to promote digital learning in schools, digital participation, and digital literacy [9]. On European Union level, The Safer Internet Programme and European Strategy for a Better Internet for Children initiative is one example [5]. Their aim is to give children skills and tools they need to safely benefit from being online. To do this, the European Commission is seeking to identify how national education systems approach online safety issues and what children learn about online safety in school [5]. For example, in Finland, online safety education is included in the curriculum in subjects related to development of media and communication skills [5, 53]. Countless educational packages by researchers and other interested parties also exist, for example, guidebooks for children [54, 55], parents [13, 14], and teachers [15] and a prototype of an educational information security board game [56]. Despite growing interest in digital literacy within educational policies, guidance of how it should be included in teaching is lacking [57] and teachers can sometimes find themselves responsible for the delivery of the online safety message with little support [58].

2.3. Children's participation in the development of online safety education

In the literature, parents and peers are usually identified as significant actors in children's online safety [11]. As the use of digital technologies increases in schools [59], education leaders, policymakers, and teachers also face the question of how to promote their use while safeguarding children [60]. However, in addition to viewing children's online safety as something that depends on the actions of others', it can also be seen as an action by children themselves, enabled by their growing independence and as a developmental process [7, 17]. Children's skills related to online behavior develop differently [53] and their developing moral judgment skills also affect their behavior [7]. It has been argued that more use facilitates more digital literacy and safety skills [61] and European pre-teens and teens are usually not unskilled when it comes to online safety; however, younger children tend to lack in skills and confidence [61].

Hence, based on the insights presented above and the growing interest in the HCI and CCI communities in children's online safety (e.g., [1, 12, 19-25]) we believe that children should be invited to develop their online safety education more often [17]. We see that the CCI researchers can make a valuable contribution here with the large existing knowledge base on how to invite children into design process. Our research group has been working with topics related to children and technology for over ten years, inspired by the ideological underpinnings of Scandinavian Participatory Design tradition. A central value for us has been children's possibility to take part and have a voice in decisions that concern their lives, in line with the Convention on the Rights of the Child [62] as well as the principles of Participatory Design [32]. In this study, however, we decided to involve children as native informants, in line with Scaife and colleagues [63], who motivate this role the following way: "It suggests that they are aware of aspects of learning/teaching practices that we are not and which we need to be told of. Sometimes this will concern content, as when they tell us what sort of feedback is fun, sometimes it will concern structural aspects, particularly when informing us what encourages learning. […]. Hence, treating children as native informants, we hope to be able to discover what we did not know rather than try to confirm what we thought we knew. We also do not treat them as equal partners, as we are realistic as to how much they can be involved, since they neither have the time, knowledge or expertise to participate in the collaborative model prescribed in PD [Participatory Design] approaches. […] children are likely to have difficulties, by definition, with articulating what needs the interactive learning environment should be meeting – Since they do not know how to express concepts that they have not yet grasped." Hence, our decision to involve children as native informants relied on quite pragmatic reasons. When acting as native informants, we see that children's expertise at being children [33] can truly benefit the further development of online safety education, but we also acknowledge the limits of children' time, knowledge, and expertise to develop their online safety education [63] and hence did not try to implement the equal partnership model, e.g., in the sense of mutual learning and equal decision-making power among adults and children. We argue that our approach to involving children nevertheless adheres well with the values of the CCI community as regards to inviting children into evaluating and developing issues affecting their life – including their own online safety education – and it enables offering in-depth, holistic views on complex issues as well as empathic understandings of children's own viewpoints and experiences.

2.4. Values and value-driven design approaches

Values tell us what is considered as important, good and right in life [42, 64, 65]. In this study, following Schwartz [38], we define value as "a (1) belief (2) pertaining to desirable end states or modes of conduct, that (3) transcends specific situations, (4) guides selection or evaluation of behavior, people, and events, and (5) is ordered by importance relative to other values to form a system of value priorities". Values are seen as desirable goals that act as guiding principles for an individual or a collective. [37]

A number of value-oriented design approaches as well as models and instruments for examining values have been proposed – even within technology related research. Different strands of value-oriented design approaches include for example Value-Sensitive Design, Values at Play Framework, Worth-Centered Design and Values-led Participatory Design. Value-Sensitive Design [64] focuses on including ethical values in design through conceptual investigation (analyses of central constructs and issues), empirical investigation (analysis of social context and particular design), and technical investigation (analysis of existing systems to understand whether and how it supports values). Values at Play framework [66] then again, focuses on ethical, social and political values through the activities of discovery (of values relevant to design), translation (of values in system design) and verification (assessing to what extent values are successfully implemented). Worth-centered Design [67] focuses on development of worthwhile, i.e., things that will be valued, through requirements analysis (understanding needs and wants of stakeholders), design (delivering prototypes that

deliver something worthwhile), evaluation (assessing the achievement of intended worth), and iteration. Finally, Values-led Participatory Design [68] focuses on working with stakeholders to support the emergence of relevant values and to develop these values throughout the process. The approach begins with the designer inquiring into people's values. Then, and throughout the design process, these emergent values are developed with participants through a dialogical process.

For our study, the value lens was adopted well after the design sessions organized with children. Hence, it was not meaningful anymore to utilize a value-oriented design approach, but instead we needed a value model for helping us in making sense of values already intermingled within our empirical data. Such models have already been utilized in technology related research. In addition to Schwartz's universal values model (utilized e.g. in [39, 69]), popular has been particularly the Value Sensitive Design model with its set of human values (see e.g. [64, 65], for critical discussion, see e.g. [70, 71]). Some researchers have proposed their own categorizations or instruments, relying more or less on the existing ones (e.g. [64, 65, 72]). Alternatively, some researchers have approached values as an open question – they are to be revealed through empirical inquiry without a predefined value set (e.g. [25, 26, 70, 73-75]). The latter type of studies emphasize the dynamic, evolving and context dependent nature of values (see e.g. [70, 75]).

Inspired by the studies examining values in technology design with children (e.g. [25, 39-42]) we decided to utilize Schwartz's model of universal values [37] as our value lens, illustrated in Figure 1, rather that conducting the analysis in a purely data-driven manner. Utilization of a predefined categorization as a theoretical framework helped us to theorize what could possibly be the motivations underlying children's feedback and suggestions as regards to their online safety education, therefore enabling creation of such education that serves children better and aligns better with their motivations and underlying values.

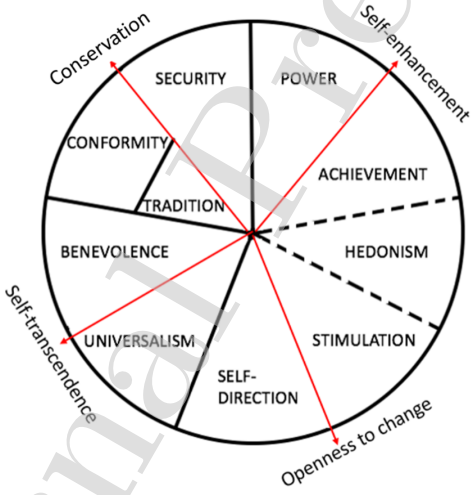

Fig. 1. Schwartz's value types (adapted from [37]).

Schwartz's theory recognizes ten universal values, which can be organized in four higher-order groups: Openness to Change; Self-Enhancement; Conservation; and Self-Transcendence. Each of the ten universal values has a central goal that is the underlying motivator for human action [37]: For *Self-Direction*, the goal

is “independent thought and action” and it can be characterized with “choosing, creating, and exploring.” For *Stimulation*, the goal is “excitement, novelty, and challenge in life.” For *Hedonism*, the goal is “pleasure or sensuous gratification for oneself,” characterized as enjoying life. For *Achievement*, the goal is “personal success through demonstrating competence according to social standards.” For *Power*, the goal is “attainment of social status and prestige,” and “control or dominance over people and resources.” For *Security*, the goal is “safety, harmony, and stability of society, of relationships, and of self.” For *Conformity*, the goal is “restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.” For *Tradition*, the goal is “respect, commitment, and acceptance of the customs and ideas” that one's culture or religion provides. For *Benevolence*, the goal is preserving and enhancing the welfare of those with whom one is in frequent personal contact (the ‘in-group’). Finally, for *Universalism*, the goal is “understanding, appreciation, tolerance, and protection for the welfare of *all* people and for nature.” According to Schwartz [37], these values are likely to be universal to all cultures [37]. When using this model, we assume that behind children’s feedback and suggestions lie universal values that motivate children to give such kind of feedback.

As regards to children and technology, Schwartz’s universal values model has already been used for analyzing values emerging from children’s use of technology [39] and value-based roles children take in the design process [69]. These studies show the model’s value in making sense of values relating to children’s technology design and use. We acknowledge the criticism on value-oriented approaches but view the Schwartz’s universal values model still as a highly useful tool in our endeavor. Even if we do not assume that such universal values comprehensively capture all values that can be associated with children’s technology design and use – nor with children’s online education – we maintain that they provide a very useful means for this yet an unexplored topic. In line with JafariNaimi et al. [76], however, we acknowledge the plurality of values. Surely, many alternative values have been left unattended to in this study due to the choice of our theoretical framework.

3. Materials and methods

3.1. Research design

Data for this paper originates from a research project carried out in school context in Finland during 2014-2017 on the topic of children’s online safety. Several different kinds of data on children’s online safety were collected and analyzed in the project, resulting in several publications: an initial literature review [45], an analysis of public discourses on the topic [12], interviews with teachers [16], and surveys with children and their parents [46]. The data set used in this paper was collected in the final phase of the project, in a series of workshops with seven classes of 10-12-year-old pupils in three primary schools in the city of Oulu, Finland in 2016. In these workshops the children engaged with three different educational packages and reflected on what they liked and disliked, what they would improve on, and if they felt they learned something. They were also invited to brainstorm design recommendations for the development of such education.

An informed consent was asked from each child and their parents. 153 children had gotten permission from their parents and 134 of them chose to take part in the three-hour workshops that were arranged as a part of their normal schoolwork. The teacher of the class was present all the time. The first author of the paper acted as the researcher responsible for organizing and carrying out the research in collaboration with the teachers and their pupils.

In each workshop, the children engaged with three different educational packages concerning online safety. The educational packages were selected based on interviews of the teachers of the participating classes (previously reported in [16]) where the teachers emphasized the importance of online safety education that

makes children think about their actions, entertaining videos that can be used to support teaching, and learning through gaming. Before the workshops, we carried out a search of existing online safety related educational packages currently available in Finnish language that met these criteria, and presented the teachers with ten educational packages that they could choose from. Based on their feedback and preferences, we then selected the three educational packages for the workshop, as the teachers felt that including any more might take too much time and tire out the children. The selected educational packages are as follows:

1. *A video and discussion* featuring story about a girl called Riikka who joins a social networking site in hopes of finding a boyfriend, and soon starts receiving messages from interesting people. What Riikka does not know is that the person she is chatting with is not who they say they are: Instead it is some of her classmates tricking her. The educational goal of the video is to teach children about social media and privacy, online friends, and bullying. The video comprises still photos and voiceover but also features animated characters: the first one is an Internet reindeer acting as a narrator of the video, and the other one is a well-known Finnish Internet police called Fobba, who pops up to give the viewer advice here and there. In designated points, the video should be paused for discussions. The topics and examples of questions to discuss with the class are offered in the accompanying instructions for teachers. This video from the Finnish Media Literacy School is targeted towards children aged 10-12. It is freely available online [77].
2. *A game* about children's rights. In the single player online game, children are competing against an antagonist: a weasel called Luikki. The educational goal of the game is to teach children's rights: The players are searching for law book pages containing information about children's rights and answering related questions. They move from one point to another by rolling a dice, as in a board game. The children can customize a character representing themselves for gameplay. The game has been produced by the Finnish Ombudsman for Children in collaboration with Agora Game Lab. It is freely available online [78].
3. *Information search and mind mapping*. In this educational package, children are advised to 1) Search for information about information security online, 2) make a mind map with keywords about information security, 3) Identify important advice concerning information security 4) List topics about information security that they would teach to children, and finally, 5) discuss in groups what to do in two hypothetical situations (presented in the instructions) that might pose an information security threat. The educational goal of the package is to teach the children about information safety, and it was developed by the 4H club. The educational package is freely available online [79].

Two of the participating teachers were previously familiar with one of the educational packages (Video and discussion), but for the other teachers, it was the first time interacting with any of those.

In the beginning of a workshop, the researcher introduced herself and the research, explained the purpose of the workshop, stressed the importance of children's contribution in designing education for their use, and reassured the children that their input is greatly valued and instead of just looking for one correct answer, all of their ideas were valued and honest answers encouraged [80]. The children were explained where data collected from them would be used, and they were told that they can at any time choose to skip any part, or quit altogether.

Then, the researcher introduced the children the first educational package. After that, the children and the teacher carried out the different tasks associated with it, and filled in the survey forms independently at the same time (30 min). The surveys contained five open-ended questions: 1) what children liked about the educational package/intervention and why and 2) what they disliked about the educational package/intervention and why (as advised by Fails et al. [81]). The children were also asked 3) if they have any suggestions on how to improve the educational package/intervention and 4) if they felt they learned

something from it. Related to this, it should be noted that we did not measure actual learning, only asked for children's opinion as to whether they feel they learned something new from the educational package. This perceived learning might have been connected with the educational goal of the educational package, or be something completely unrelated. When the classes were experimenting with each educational package, the researcher took the role of an observer but engaged with the participants if she was addressed.

The procedure described above was repeated for all three educational packages. Finally, at the end of the workshop, the children were asked to 5) brainstorm advice for developers of online safety education targeted at children, and to write down their ideas down. To support their ideation, we provided them with two support questions they could reflect on if they wanted: what kind of topics they think are important to learn about online safety, and what kind of education they would like to receive about online safety.

The children had normal recess and lunch times during the workshops, not to tire them out [80]. Answering each individual question in the survey was voluntary, and not all 134 participating children chose to answer each question. The response rate for each question is presented in Table 1.

Table 1: Response rate to different questions

	What did you like about the education	What did you dislike about the education	Improvement suggestions concerning the education	What kind of things did you learn from the education	Advice for developers
Video and discussions	89,6%	75,4%	75,4%	79,9%	
Game	90,30%	89,6%	81,3%	62,7%	77,6 %
Information search and mind mapping	82,1%	77,6	62,7%	59,7%	

3.2. Data gathering and analysis

The workshops were video and audio recorded. The main data used in this paper are the researcher's field notes from each workshop (including any direct spoken feedback from the teachers and children), and children's comments written in the survey forms during the workshops. In some classes, the teacher decided to include in the learning context also the children without research permit. In this case, caution was taken that no data (survey forms, photos, or recordings) were collected from these children.

After the workshops, field notes and children's comments from the survey forms were transported into NVivo (a qualitative data analysis tool). The analysis of the data was an iterative process consisting of three main activities: data reduction, data display, and conclusion drawing [82]. In the first phase of data analysis, the first author coded children's likes, dislikes, improvement suggestions, and learning concerning each educational package as well as their suggestions for future education. The same procedure was done to the researcher field notes. The categories were discussed between co-authors and iterated several times.

In the second part of the analysis, we pulled reports out of NVivo and discussed between co-authors, in order to find those topics that received most attention in the data. Three data-driven categories for the data emerged: the children discussed the *format* that facilitated learning (e.g. video, game), the *topic and content* of the educational packages, and the *characters* present in two of the packages. In addition to explicit design recommendations proposed by children, the research data included some more implicit recommendations. These were discussed and included in the analysis as well.

Finally, in the last round of analysis, the value lens [37] was utilized to make sense of children's motivations underlying their answers (i.e. their feedback and design recommendations). When looking at all their responses we analyzed what children find important, and what is the motivation or goal that us underlying this response or recommendation. We analyzed the descriptive values, i.e., "what stakeholders factually consider important", not the normative values, "what they should regard as important" (see [71], p. 282). We analyzed comments of the direct stakeholders, children. In this analysis we did not have data from the indirect stakeholders, such as teachers or children's parents (see [71] about stakeholder analysis), while we have already analyzed the thoughts of these other stakeholders in previous papers, see [16, 48].

3.3. Limitations

Even though an effort was made to encourage honest answers, the study took place in school environment and the presence of teachers, peers, and researchers may have influenced the answers of some children, meaning they gave 'socially desirable' answers. We also acknowledge that the educational packages used in the study likely influenced children's answers: they primed and sensitized the children. Furthermore, it is important to acknowledge that these results are culture and context specific in many ways. Quite a limited number of school classes (pupils and their teachers) took part in this study. Surely, with different teachers, pupils, and interaction and history related factors among them, the results would have been different. On a broader scale, also the cultural context and Finnish educational system inevitably shaped the results. Moreover, it was not possible to, for example, compare the values between children as we did not focus on values in our data collection but it was possible to do this kind of general analysis.

As for epistemological issues more generally, it needs to be reminded that this was not an objective evaluation of the effectiveness of children's online safety education carried out along the lines of experimental research tradition, but a qualitative, exploratory study on children's own issues and interests as regards to their online safety education through subjective self-report. As such, this is not a limitation of this study, while it should be kept in mind when reading through the results.

4. Results

Next, we present our results regarding each educational package: how it was carried out, what children liked and disliked in it, children's assessment regarding whether they learned something, and their improvement suggestions. Finally, we report children's design recommendations for new online safety education.

4.1. Video and discussion

The first educational package was the video and discussion, where the goal was to educate children about social media and privacy, interacting with online friends, and bullying. The role of the researcher was limited to introducing the package and pausing the video at designated points to allow discussion. The teachers led the conversation with the class with the help of instructions accompanying the video. The teachers were provided with the links to the video and associated teachers instructions well in advance. An example setting in the classroom can be seen in Figure 2.

Fig 2. A video and discussion.

Learning situation varied between classes, depending largely on the activity level of the teachers. In four of the classes, teachers had a very enthusiastic approach, asking children questions specified in the instructions but also making follow-up questions if interesting themes emerged from the children's answers. In these classes there was very lively conversation going on, even when two of the classes had seen the video before. We needed to keep track of time not to go over the allotted time slot. The children made some interesting points during the discussions: In one class, they discussed cliques that form in social media, and how easy it is to make someone feel unwanted. In another class children reflected how easy it is to make mean comments online, and advised each other how everyone who gets those comments should just learn to shrug those off. These discussions can be connected with the universal values identified by Schwartz [37]: they seem to reflect children's need for Security, that is, harmony and stability of society, or relationships and of self. The latter also seems to reflect their values of Self-Direction and Benevolence: The children were urging each other to strive for independent thought and action in order to preserve and enhance the welfare of the group. In the remaining three classes, the discussions were more restrained. The children watched the videos in peace, but the conversations were not vibrant. In one class, the teacher stuck rigidly to the planned questions, and in two classes, the teachers were confused at first about what they were supposed to do and what they were supposed to ask. This set the tone to the discussions and only few children participated when asked for input by the teacher. The teachers' enthusiasm and engagement was clearly reflected in children's active participation. This demonstrates how children value Stimulation provided by their teacher.

Likes and dislikes. In addition to general comments about liking or disliking the educational package, the children's notes concentrated on format (video and discussions), the topic and content, as well as the characters present.

Format. The children enjoyed the format. They commented that they like watching videos and the video made it easy to understand the topics discussed: *"I got to watch YouTube, that was fun"* (Child 15). "*I liked this exercise, because it had a video"* (C59). "*We got to watch a video, and that made us understand better"* (C22). Comments like these imply that children valued the way of learning because it fits their media culture and they value having fun (i.e. Hedonism). The format also provided them with Stimulation and a sense of Achievement. The children also liked that during discussions, they could engage with others and share such things openly that might affect the whole class – group discussions enabled learning things you might otherwise have missed: "*I liked the discussions, because others were sharing things I had not noticed"* (C51);

"*I liked the fact that during this we got to speak openly"* (C39). These findings seem to reflect children's value for Security and Benevolence, the children wanting to feel safe in relationships and preserving and enhancing the welfare of others in the class.

The children also expressed criticism. They disliked the fact that the video mostly comprised still photos and voiceover: *"The scenes in the video were made of pictures, video would have been better" (C92).* It was also noted that during animated bits the sound and picture were sometimes out of sync: *"I didn't like it when Fobba's voice and mouth did not go together"* (C15). They also disliked the need to pause the video for discussing the themes, pointing out that this affected the flow: *"We were discussing the whole time, you never got into the video properly"* (C102). *"I was annoyed we didn't watch the whole thing through at once"* (C35). These dislikes concern things that made the educational package less enjoyable for children, thus lowering its Hedonism value. Some children considered the discussions boring, quoting reasons like them lasting too long, or already knowing the issues: *"The discussions were too long and we kept going over and over the same things"* (C22). *"It was repetition of old things. They could have updated it a bit*" (C84). In addition to lacking Hedonism, for these children, the video and discussions did not offer enough Stimulation.

Topic and content. The children commented that the video dealt with an important topic in their lives: *"This video was discussing about a real topic"* (C32), *"The things were true"* (C18). Some specifically described liking, for example, that the girl in the video did not choose to go on to meet an online friend alone:*"I liked it that Riikka took a friend along for the date"* (C43). Instead, by telling a friend, she showed capability for Self-Direction – independent thought and action –this way of acting was valued by the children.

The children also offered criticism for the topic and content. They commented disliking the boys in the video behaving badly and bullying others: *"I disliked that the boys took secret photos of Riikka and her friend and planned to put them online"* (C45). They also pointed out that perhaps Riikka was not behaving that well herself: *"I disliked that Riikka lied to her parents about going over to a friend's house to watch a movie.* These kinds of comments likely reflect children's value for Conformity and Benevolence – restraining actions, inclinations and impulses that might upset others, and preserving the welfare of those who one is in frequent contact with.

It was also noted that some might get a feeling after watching this video that one should never meet anyone online as all strangers are bad: *"I think that the video made it seem like there is no reliable people online, and you shouldn't make new friends there"* (C38). Some children also commented on the lack of more concrete advice for children regarding meeting people online, i.e.: *"There were too few instructions on how to prevent this from happening" (*C3), and *"You were never shown how the girl coped"* (C7). We interpret this kind of comments as children hoping for more support for fulfilling Self-Direction as well as Security values: supporting their independent thoughts and actions in order to improve their safety.

Characters. The children felt that the animated characters brought some needed change to the video that was mostly made up of still photos (i.e. it provided needed Stimulation): "*I liked the Internet police and the reindeer that was commenting things, they brought needed change in the video"* (C48). While the other characters split children's opinions, the Internet police character received mostly praise. The children commented that the character was funny, and they liked knowing that there actually is a police officer online that they can turn to – providing this kind of concrete advice enhanced their feeling of Self-Direction and Security: *"I liked it that you can tell 'a net police officer'*[†] *if someone is bullying you"* (C53)

[†] In Finland there is a virtual group of police officers (see https://www.poliisi.fi/finnish_police/police_in_the_social_media) tasked with interacting with people in the Internet and creating the law enforcement presence there, to combat against harmful behaviour. In Finland the attitude of the population towards law enforcement is generally very positive and they are highly respected and trusted, so this is considered a positive thing.

Perceived learning. Quite many children said that they learned nothing from the video, or at least nothing they didn't already know. For those children, educational package was perhaps not stimulating enough. However, the majority commented learning something related to the educational goal of the video. While some made quite general comments like: *"I learned about online safety"* (C41), others made more specific comments like learning that not everything online is true: *"You shouldn't believe everything that it says on the Internet"* (C87) and: *"There is such a thing as fake profiles"* (C25). Some mentioned learning the importance of support: *"You need to tell your parents, no matter how embarrassing it feels"* (C70), *"I learned that you should always ask for help"* (C61). Children also learned about privacy: *"Not to post photos of friends without permission"* (C90), *"Not to share photos of yourself to strangers"* (C53). Some learned what to do when meeting new people online: *"You shouldn't go alone to meet someone you meet online"* (C13); *"I learned that if you want to get to know someone online, you need to be sure they are who they say they are"* (C70). However, many also took a very concrete lesson that it is just bad to talk to people online: *"I learned that one should never talk to strangers online"* (C60) and *"I won't meet people online"* (C67).

Improvement suggestions. The majority of improvement suggestions concerned the things the children had identified disliking in the video – Changing them would make the video more enjoyable, and thus increase Hedonism. Concerning format, comments included adding moving picture instead of still photos with voiceover: *"It could have more video"* (C109). They would also improve sounds and narration "*I would improve the narration"* (C23), *"Fobba's voice and mouth could go together"* (C15). Some wished for less discussions, and there was a consensus that if you have to discuss, you should leave it at the end of the video: *"We should watch it through right away and talk after that" (C10), First the WHOLE video and afterwards a short discussion, or no discussion at all* (C78). Comments concerning the characters dealt with getting rid of characters they didn't like, or encouraging them to perform better, i.e.: *"Get rid of the reindeer and Fobba, they are too weird"* (C128), and *"Get better actors, and the narrator could speak more clearly"* (C68).

Concerning content, children suggested making the video shorter or longer. Some also proposed changes to the plot, so that Riikka might not have gotten bullied: *"I wouldn't go on the date in the first place"* (C21), or "*I wouldn't have told my information to strangers"* (C81). Children also suggested adopting a more positive tone related to children's Internet use overall, and offering more concrete advice for Internet use. One child, for example, wished that *"it could have been told how to know if someone is dependable"* (C99). Another would explain that *"You can find real and good friends online too!"* (C57). Our interpretation is that these comments reflect that, in addition to education that increases their Security, children want education that provides them opportunity to enhance their Self-Direction and takes into account their media culture (Traditions), instead of making them feel bad about it.

A summary of the main values mapped concerning video and discussion task is seen in Table 2.

Table 2: Main values mapped concerning video and discussion task

Value	Examples
Hedonism	Watching videos considered fun. Pausing for discussions was disliked, children would have preferred to have them at the end. Adding moving picture was suggested as video mostly comprised still pictures and narration.
Stimulation	Engagement and enthusiasm of the teacher affected children's participation to discussion. Children who had seen the video before or found the discussions too long expressed being bored.
Self-direction for Benevolence	Events in video where main character showed self-direction were liked, actions that might upset others disliked. In discussions children urged each other to strive for independent thought and action to preserve welfare of their class.
Self-direction for Security	More concrete advice hoped for, concerning meeting people online and coping with possible negative outcome. For example, liked knowing there is a net police officer to turn to if needed.
Tradition	Advocated respecting children's media culture and taking a more positive tone related to their Internet use.

4.2. The game

In the next phase, the children started to play the online game with school laptops, forming small groups and taking turns in gaming when there were not enough laptops for everyone. The goal of the game was to educate children about their own rights. The fact that the game was for a single player caused a little tension, as some children felt they did not get equal time with the game. The researcher again made a brief introduction and after that the teachers led the work with their classes. During gameplay, the teachers were present in the classes, but mainly concentrated on other things and let the children play independently. The children all started playing the game very enthusiastically and when it was time to quit we were met with quite a resistance. An example of a gaming situation is illustrated in Figure 3.

Fig. 3. A child playing the game with school laptop.

Likes and dislikes. In addition to general comments about either liking or disliking the educational package, the children's concentrated on commenting format (game), topic and content, as well as the characters present.

Format**.** The children were happy to use a computer: *"I liked it because I got to play games"* (C39), *"I got to be on a computer, because computer is fun"* (C94). Comments like these imply that the game helped in filling their need for Hedonism; they liked it because they value having fun.

Their dislikes concerning the format mostly concerned the difficulty level. Many children felt the computer was impossible to beat: *"Too difficult game ends fast"* (C3), *"Can't be won"* (C128). While the children value Achievement, they felt robbed of the possibility. Related to this, moving in the game was done by using the Z key on the keyboard which was widely disliked as being hard and unusual: *"I didn't like the fact that you couldn't move with arrow keys"* (C35), *"The controls sucked"* (C120), *"The controls were really bad. Moving with the Z key? Whaat?"* (C127). While for most the unusual controls seemed to reduce their sense of Achievement and decrease the Hedonistic value of the game, one child noted actually liking the fact that moving in the game was made difficult, probably enjoying the extra Stimulation this provided.

There were also some bugs identified during gameplay*: "When I got to the labyrinth, my character glitched out of the game area, and I lost"* (C24); *"It kept jamming […] I rolled the dice once and the game*

said I had won." (C51). Some children also disliked the sounds or graphics, i.e.*: "The look of the game was boring"* (C130) or *"Luikki's voice was annoying, and the sounds in general"* (C104). These comments indicate that the game partly failed in creating Hedonistic value for children.

Topic and content**.** The children liked the topic- teaching the children about their rights: *"I liked it that the game stood up for children's rights"* (C10), *"I liked the idea of the game"* (C48). They also liked the fact that there were different fields inside the game and commented that it was *"fit for all ages and simple"* (C43) – thus reflecting that in their opinion the game provides Stimulation for other age groups as well. However, some felt that the game was maybe even too simple (even boring), and maybe targeted to a younger audience: *"The game was fast and boring"* (C27), *"It was a little childish"* (C100). Some also commented that the game was quite short and the quests in it were too similar with each other. We interpret that for these children the content was lacking in the needed Stimulation, which children most likely are used to in commercial games made with larger budgets and developed with that value in mind.

Characters. The main antagonist of the game, a weasel called Luikki, certainly got a bad judgement. Some saw the character as a bit scary: *"Weasel Luikki was annoying and scary at the same time"* (C133), but the majority of comments dealt with it being too difficult to beat. There were multiple mentions of the weasel always rolling sixes in the game and reaching the finish line earlier: *"I didn't like it that the weasel kept winning"* (C57), "*I didn't like it that the weasel was too bad"* (C58). These kinds of comments again probably reflect back on the fact that the children felt robbed of sense of Achievement. A blue cat was found cute, however, and even the poor weasel Luikki was appreciated by some: *"I liked weasel Luikki, because it was cute"* (C38). Customizing own characters also increased the Hedonistic value of the game: *"Creating my own character was the most fun"* (C15). Some children spent a significant amount of time customizing their characters, valuing the extra Stimulation and the possibility for Self-Direction: choosing, creating, and exploring.

All in all, when describing their likes and dislikes concerning the game, children paid much attention to user experience in this educational package, the key elements being game design and user interface design.

Perceived learning. The majority of the children said they did not learn anything from the game, or at least can't recall. Maybe this is because they were immersed in the game play and did not even realize its educational value, or maybe as they were lacking the sense of achievement losing to the computer they didn't believe they learned much. Some learnings were however connected to the educational goal of the educational package. While some commented quite generally that the feel they learned about *"children's rights"* (C3), children also mentioned specific things, such as: *"That adults should tell you when to go to bed"* (C10), or that *"Children also have the right to have free time"* (C106). Some commented learning how the game is played: *"I learned that when the arrow moves, you have to press Z"* (C99).

Improvement suggestions. The majority of improvement suggestions had to do with the things the children had identified disliking in the game. Concerning format, children focused on better user experience and making the game more enjoyable i.e. more Hedonistic. They would change the controls to a more familiar format: "*I would move with the arrow buttons"* (C2), *"make the movement button to be the arrows"* (C53). Children would also fix bugs, for example by: *"Making the whole screen button to work"* (C42), *"I would make it so that you wouldn't get outside of the labyrinth"* (C47). They also mentioned improving sounds: *"Better sound actors"* (C97), *"Clearer sounds"* (C102). Regarding content, children mostly suggested adding more fields and activities to make the game last longer and increase Stimulation: *"It should be longer and have more fields"* (C4), *"It could have had more different games and fields"* (C99). They would also adjust the difficulty level so that everyone would have the chance to beat the computer and get a sense of Achievement: *"The weasel's luck should be restricted"* (C60), "*The characters shouldn't be so good"* (C117). Most improvement suggestions concerning the characters also related to lowering the difficulty level of the game and increasing sense of Achievement – they would make the main antagonist easier to beat: *"The*

weasel wouldn't be throwing all sixes" (C94). Some also called for more possibilities in character customization (Self-Direction): "*There should be more choices when making characters*" (C40).

A summary of the main values mapped concerning the gaming task is seen in Table 3.

Table 3: Main values mapped concerning the game

Value	Examples
Hedonism	Children liked the task because they like games and being on the computer. Bugs were however identified and corrections suggested. Sounds and graphics of the game received criticism and it was suggested they should be improved.
Self-direction	Customizing your own character for game play was seen fun, many children spent considerable amount of time doing this.
Achievement	Moving in the game was seen unusual and hard and changes were suggested. In general, the game was seen too hard and the main antagonist was widely criticized as it kept winning. Lowering the difficulty of the game was suggested.
Stimulation	Different fields inside the game were liked, and it was seen fit for all ages. However, this made the game maybe even too simple. Making the game longer was suggested, as well as adding more versatile minigames.

4.3. Information search and mind mapping

The information search and mind mapping task had the goal of educating children about information security: what it entails, what is important advice to keep in mind concerning it, and to brainstorm in groups what they could do in case they encounter some information security threat. The task was done using either laptops or own smartphones, and it proved to be the most challenging educational package for the children. The researcher gave a brief introduction and the teacher then took charge of carrying it out with the pupils. An example setting can be seen in Figure 4.

Fig. 4. Two girls preparing their mind maps

In one class, the teacher recommended the pupils to use Padlet app (https://padlet.com/) to share links and information with each other. They had also used the technology previously, and after Padlet was started, the

children needed very little help, working quite independently and discussing with each other and creating their mind maps. The mind map and keywords seemed to be familiar concepts, and only a little murmur rose, that mind mapping was difficult. A screenshot of the Padlet children constructed is illustrated in Figure 5.

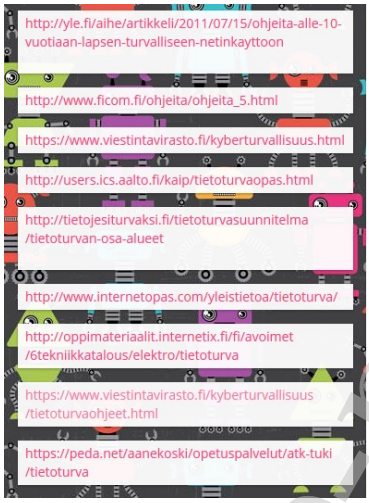

Fig. 5. Screenshot of shared links in Padlet app

In other classes, the teachers took a more passive role, e.g., reading assignments when the children worked. After a while, murmur started: Some children were not familiar with mind maps and were having trouble constructing it, some had difficulties searching for information. They seemed to be lacking a sense of Achievement, being left to tackle these issues on their own. These scenarios again show how important teacher engagement is for children's Stimulation.

Likes and dislikes. In addition to general comments about either liking or disliking the educational package, the children's commented on format (information search, mind mapping) and the topic and content.

Format**:** Many said that they enjoyed the fact that they were allowed to go online with their mobile phone or computer, and they liked it because they value having fun (connected to Hedonism): *"We got to do it with a laptop"* (C8), "*I liked being on my phone. Phones are fun"* (C77). The children also enjoyed the freedom to work independently: "*It was free, and on the other hand easy"* (C65), "*I liked it, because you could do it independently"* (C56). Browsing the Internet for related information received positive feedback, with one child pointing out that: *"When I search for information myself, it sticks"* (C2), and another one saying that the best thing was *"Googling, because it is always fun"* (C55). The children also enjoyed the mind mapping, putting their thoughts on paper by drawing and writing: *"I liked making the mind map, because I got to write down my thoughts"* (C47), *"I liked making the mind map, because I like to draw and write*" (C44). These comments reflect children's value for Self-Direction, independent thought and action while exploring the Internet, and a sense of Achievement when succeeding in the tasks.

As for dislikes, some children explained that they found it hard to find relevant information: *"I didn't like it because I couldn't find things that well"* (C61), *"Information search was hard and difficult"* (C37) and that *"There are too many websites"* (C122). Some commented disliking the preparation of the mind map, for example because they did not enjoy writing or because the process was not that familiar to them: *"It was*

boring to write" (C34, C42), *"I didn't like it because you had to work alone and I can't do mind maps that well"* (C80). For those children, Stimulation or the sense of Achievement was lacking.

Topic and content**.** In their positive comments, the children commented that the topic was educational and they learned something in the process: *"It was really nice that you got to read a lot about online safety"* (C13), *"It was educational, very interesting"* (C121). However, many found the topic and content to be a bit boring, i.e., it was lacking Stimulation: *"I didn't like it, it was boring"* (C12), *"The topic was not interesting!"* (C97). Some children noted that there are too few instructions given to carry out the information search and mind mapping successfully: *"I didn't understand this and I couldn't find information"* (C57), *"stupid assignment, the rules were unclear"* (C35), *"I didn't like it that there were so few instructions"* (C56), this lack of instructions seemed to deprive them of the sense of Achievement.

Perceived learning. The majority of comments were related to learning something concerning the educational goal of the educational package. However, most comments were rather general in nature, not describing what was learned in detail: "*I learned a bit about information security*" (C68), or "*I learned that information security is important"* (C75). Some children identified learning threats to information security and online safety: *"Information security prevents online terrorism"* (C94), "*Viruses spread fast"* (C90). Some learned about safety mechanisms such as passwords and digital signatures: *"I learned how to pick a password"* (C53). However, a little off-topic, some children commented they learned how to search for information online, and a large portion of the children said they learned nothing.

Improvement suggestions. Most of the improvement suggestions concerned things children had identified disliking earlier. Concerning format, most comments had to do with the mind map. Some children commented it should have been removed completely, only doing the information search. Some would have liked to do the mind map on a computer: *"The mind map would be made with a computer"* (C52), *"The whole thing would be made with a computer or a phone"* (C102). This would have made the educational package more enjoyable (i.e. increased Hedonism) for the children that disliked writing by hand. It would also have increased Hedonism because as children earlier pointed out, they like interacting with technology. Others would have enjoyed the possibility to decorate the mind map, or to do it in another way which shows they value Self-Direction, independent thought and action: *"I would have liked to decorate the mind map"* (C45). *"It would have been better if the thoughts could have been written down with bullet points"* (C48).

Concerning the content, the children would have provided some links to make information search easier: *"I would give a couple of websites where to look for information"* (C33), *"There would be some ready links"* (C31). They would also add more instructions on how to carry out the tasks in the first place*: "I would make clearer instructions about what we need to write about"* (C13), *"I would improve this by giving more instructions"* (C56), "*I would give better instructions on how to make the mind map"* (C32). These suggestions imply the children would have wanted to enhance their Self-Direction and sense of Achievement.

A summary of the main values mapped concerning information search and mind mapping is seen in Table 4.

Table 4: Main values mapped concerning information search and mind mapping task

Value	Examples
Hedonism	Being on the phone, browsing seen as fun. The possibility to do also mind mapping with phone or computer suggested as improvement
Self-direction	Preparing the mind map individually, searching for information alone was liked. Possibility to decorate the mind map suggested as improvement
Achievement	Succeeding in the task that was seen challenging was liked. Sense of achievement lacking for those children who found the task too hard. Providing more instructions suggested as improvement.
Stimulation	Some kids saw the topic boring

4.4. Children's advice to the developers of online safety education

At the end of the workshop the children brainstormed advice to the developers of online safety education. To support their ideation, we provided them with two questions they could reflect on if they wanted: 1) what kind of topics they think are important to learn about online safety, and 2) what kind of education they would like to receive about online safety. It should be noted that while in this phase a free flow of ideas was encouraged and the children were told that their ideas do not have to be realistic or feasible [81], the ideation process was most likely somewhat influenced by the educational packages the children had just engaged with.

Preferred formats. Most children would carry out future education through a game: *"I would like to teach others online safety through a videogame"* (C4), *"One should make more games, because kids like games, and they learn while playing"* (C66). Some would create an educational video: *"I would show a video and discuss online safety"* (C46), *"We could do a movie/video with the class"* (C71). Also inviting external speakers like the Internet police from the video was discussed: *"I would invite Fobba and the reindeer to talk to the class"* (C80), "*I would ask some police to come and talk to us about online safety for one hour*" (C76). In other words, the children would carry out the education in ways that provide most Hedonistic value and that connect to their media culture (Traditions). Children also commented that they would have liked to learn while doing, surfing the Internet during lessons: *"I would like it if we could be online"* (C107), "*That one could use social media by themselves while being taught"* (C101), *"Experiencing by yourself and discussions based on them"* (C84). In addition to bringing them Hedonistic value, this kind of education would also provide them Stimulation and allow for Self-Direction.

Important topics to learn about reflect the children's value of Conformity (not violating social expectations and norms), as well as Benevolence (preserving and enhancing the welfare of those with they are in frequent contact with). The most commented topic concerned the importance of knowing that not everything online is true: *"Not everything it says on the Internet is true"* (C84), or *"You need to be careful when talking to strangers"* (C48). The topic of bullies was also brought up: *"You need to know that there are bullies online"*. Many also stressed the importance of privacy online: *"Don't tell your address, phone number or other personal info"* (C75), *"Don't tell others your password"* (C49) as well as thinking about what kind of content you post; as *"everything you put online stays there"* (C18). Children also wished to learn about what is appropriate conduct online towards others, for example that you *"Don't publish photos of others without asking"* (C24), and you *"Don't bully others online"* (C8). Some children also raised information security issues, like viruses and different scams, as important topics to learn about: *"Don't press pop-up windows"* (C2), *"It is important not to get scammed online"*, *"Don't go to pirate bay – Viruses!"* (C12). Some brought up thinking about what kind of services you join: *"I think it is important to learn that you shouldn't go on dating websites"* (C21), and that *"Age limits should be obeyed"* (C31). Finally, the children wanted to remind others, that it is important to talk to their friends or parents when you are in trouble or in doubt: *"If someone is bullying you, always tell your parents"* (C24), "*Don't make accounts anywhere without your parents or other adults knowing about it"* (C35), "*Don't go to see strangers without a friend"* (C43), *"If you message to strangers, tell your parents. Don't go to see them without permission"* (C71).

In addition, the children noted that they would also *"teach about the good stuff"* (C32) related to Internet use, with a group of four children commenting identically in their notes: *"it is important that there is not too much lecturing about this, because you get the feeling that you are not allowed to do anything online"* (C33, C36-C38) and one adding on the topic of meeting new people: *"Not everyone is what they seem. But some can be."* (C65) In addition, the children also voiced their wish for concrete advice, for example *"to show*

how to turn Instagram private" (C78), and *"…if it is OK to accept friend requests from strangers*" (C53). Some noted that *"you should teach these things to younger pupils"* (C32) as *"most first and second graders [6-8-year-olds] already have smartphones"* (C39). These kinds of comments indicate that children want education that provides them opportunity to enhance their Self-direction and takes into account their media culture (Traditions), instead of making them feel bad about it.

A summary of the main values mapped concerning children's advice for the developers of online safety education targeted at them is seen in Table 5.

Table 5: Main values mapped concerning children's advice for the developers of online safety education

Format Values	Examples	Topic Values	Examples
Hedonism	Education through the format they enjoy: a game or video preferred	Conformity	Advocating topics like not telling anyone your address, phone number, or passwords
Stimulation	Being online more browsing the internet or using social media and discussing afterwards suggested	Benevolence	Learning about what is appropriate conduct towards others online, hoping teaching would be started earlier
Self-direction	Learning by doing, experiencing independently advocated	Self-direction	Including more concrete advice to be able to cope independently
Traditions	Respecting children's media culture	Tradition	More positive tone concerning internet use, teaching about the good things you can do online

5. Discussion

In the current study, we wanted to understand how children engage with and perceive online safety education targeted at them and what kind of design recommendations they offer for the development of such education. We wanted children to have a voice as regards to this matter as well as introduce their issues and interests to the academic discussion. Moreover, we wanted to gain more in-depth understanding of the issue and examined also values underlying children's choices and recommendations. We arranged workshops with children who engaged with three different educational packages for online safety and brainstormed design recommendations for future education. In our data analysis we utilized Schwartz's ten universal values model [37] as an analytic lens/theoretical framework. Next, we will discuss our results and their implications.

5.1. Values underlying and driving online safety education of children

The CCI community has already recognized the significance of values shaping and underlying children's technology design and use (e.g., [25, 39-42]. This study showed that values play an interesting role also in shaping and underlying children's views as regards to their online safety education. During our workshops, both children and teachers gave generally positive feedback on the different educational packages that they engaged with. The teachers perhaps welcomed the support in approaching a subject that previous research has identified to be somewhat difficult for them to tackle alone [16, 57, 58]. Previous research has recognized teachers as important actors in children's online safety as they have opportunities to inform children about these issues [11] and can shape attitudes and behavior [11, 48, 83]. In our research, the impact of teachers in the engagement of the children was very visible. In classes where the teacher had gotten familiar with the educational package beforehand and approached it enthusiastically the children engaged more with each other and with the teacher than in classes where the teacher had not had time to look at the materials, or was preoccupied. Thus, we can say that teacher engagement seems to clearly contribute to children's learning as regards to online safety; teacher engagement was here particularly connected with Stimulation of children.

However, we must point out that in this study we did not focus on teachers – on their issues, interests or values as regards to children's online safety education – but on children.

As for children's perspective, summarized in Figure 6 are basic values [37] depicted in children's comments and answers regarding online safety education targeted at them. Color of the sector in Figure 6 shows the relative weight of the value in our data: values marked with dark grey were more prominent in the data while light grey ones were also visible in it. Our data did not include values related to sectors marked with white.

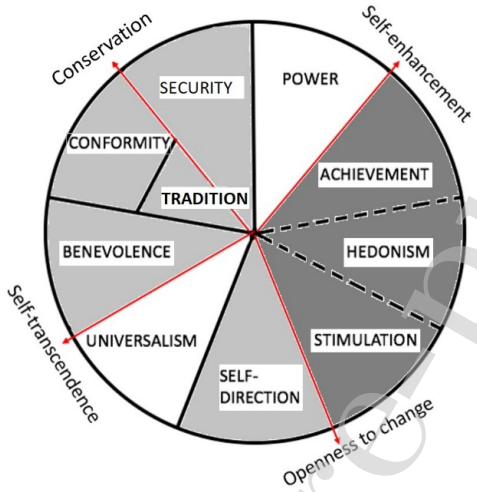

Fig. 6. Basic values depicted in children's comments

Overall, the children reacted quite positively towards the online safety education provided. They might have welcomed a disruption to the normal school day, especially as it involved the chance to use a computer or their smartphones, which are increasing in importance to ever younger children [4]. In addition to computer and smart phone use, the children indicated enjoying playing games and watching videos. These findings can all be connected with Hedonism, the children indicating that all these activities provide them pleasure and are enjoyable as such. The aspects children liked in the educational packages were also often connected with Stimulation and Achievement. The children preferred stimulating, easy to understand ways to learn, as well as a sense of Achievement. The three values of Hedonism, Stimulation and Achievement were the most emphasized ones by the children when they were envisioning their online safety education. We see these values as complimenting each other as they all have a goal that can be linked to self-gratification: increasing excitement, novelty and challenge in life, pleasure or sensuous gratification and enjoying life, as well as personal success through demonstrating competence.

The children reported of enjoying watching the video; watching videos overall gives them pleasure – they did not like the interruptions of the discussions, which they saw as reducing the hedonistic value of the educational package, instead they would have had the discussions in the end. They also paid much attention to the design of the video, the animations and the sounds. The game was started very enthusiastically and independently. However, many children got frustrated with that the computer seemed impossible to beat;

thus, robbing them the sense of Achievement. In addition, many commented that the game was short, its maps too repeating, and the content boring. One could think that these issues would affect how enjoyable and stimulating the game was, but it was still the most liked educational package. In fact, children played so eagerly it was hard to get them to stop when the time was up. In general, children voiced that they were just happy to be on a computer, and that this way of learning was fun because they liked gaming (i.e. it had Hedonistic value to them). As one child put it: *"The game was the best one, but it was still bad*" (C28). Finally, when doing the information search and mind mapping, the children enjoyed the independence and surfing the web either with their laptop or their smartphone. However, the content and the topic were considered to be a bit boring (lacking Stimulation) or difficult and the instructions were found inadequate, resulting in frustration and loss of Achievement. Adding more instructions on how to carry out the information search and mind map and perhaps using a computer to construct the mind map were considered to be good ideas.

Despite disliking the interruptions of the discussions, children felt that they learned the most through the video and discussion. Next came the information search and mind mapping, while not many could recall what they learned from the game. As important topics for education, they raised issues that dealt with content threats, contact threats, conduct threats and computer or information security threats [8, 43] like for example understanding that not everyone or everything online are what they seem, and the importance of privacy (content and contact threats), learning what is appropriate behavior online (conduct threats) and what are the information security issues related to Internet use (computer and information security threats). They also stressed the importance of relying on people close to you for support, mainly parents and friends (social mediation), who have also been identified as important actors in children's online safety by the previous literature [11]. The identified topics were some of the ones discussed in the educational packages the children engaged with earlier, and it is likely that this guided the children's answers ('we just talked about this, so it must be an important topic'). What is interesting however, is that children could be seen to think about the common good, and value of Conformity (not violating social expectations and norms), as well as Benevolence (preserving and enhancing the welfare of those with they are is in frequent contact with).

To summarize, when discussing **HOW** they want to learn, children's answers indicate that they want education that provides them with:

- Stimulation: excitement, novelty, and challenge in life.
- Hedonism: pleasure or sensuous gratification for oneself – enjoying life.
- Achievement: personal success through demonstrating competence according to social standards.
- Self-Direction: independent thought and action—choosing, creating, exploring.

These are all value types which typically serve individual interests. However, when discussing **WHAT** is important to learn, the children also brought up issues that show that they seem to value Benevolence (preserving and enhancing the welfare of those with whom one is in frequent personal contact) and Conformity (restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms). These are value types that typically serve collective interests. Hence, even among children very different value orientations can be identified, not to mention the adults that very likely do not share or put equal weight on the values the children prioritized. Value theories[37, 38] posit that certain kinds of values are in conflict with each other: change oriented (e.g. Stimulation, Self-Actualization, Hedonistic) with stability oriented (e.g. Security, Tradition) as well as individual oriented (e.g. Hedonistic, Self-Actualization) with collective oriented (e.g. Tradition). In our study, however, we do not see these different value orientations identified to cause conflicts, as the change and individual oriented values connect with HOW online safety education is to be offered, whereas the stability and collective oriented relate to WHAT is to be learned within the education.

Even if there is no existing research on values driving children's online safety education, some linking with existing research can be done. Nouwen and colleagues [25] and Van Mechelen and colleagues [41] show that values indeed are heavily involved when children or adults are designing interventions relating to children's (online) safety and well-being. In addition, value conflicts between different stakeholder groups are possible. In an educational setting, there may be a lot of conflicts and controversies in the issues raised and interests advocated by children and teachers. Children's Hedonistic and Stimulation-oriented values may not easily fit with teachers' values, even if achievement as a value is likely shared by all stakeholders in educational settings. Furthermore, we acknowledge that even if our data does not allow examining differences in values among the participating children, surely children do not form a monolithic, homogenous group of people with a shared, static set of values. Hence, value differences and possible conflicts need to be acknowledged even among children themselves. Then again, value sensitive approaches (e.g. [25, 42] emphasize explicit and open examination and negotiation of values and potential value conflicts. This is something we welcome future CCI research to tackle. A related issue is that both adults and children should be invited into the process of discussing and negotiating on the values and potential value conflicts. Moreover, as the results of this study may be strongly related to the educational packages that the children engaged with – they may have limited children's imagination – we warmly suggest further research where children are invited more fully into the design process, experimenting with and exploring more widely the notion of online safety education as well as its associated values and different forms and means. Children could possibly even as be invited to adopt the role of protagonist [84, 85] in the design of their online safety education. Then they would be having more serious responsibility and power on how their education is planned, they would be invited to critically reflect on technology, on its consequences, on associated values as well as on online safety education offered.

Manders-Huits [71] criticizes universal values presented e.g. in Value-Sensitive Design (VSD) [64] as too vague and difficult to apply in design. We think that our approach of using the predefined categorization of Schwartz's universal values to explain the motivations behind children's suggestions gave structure and depth to our analysis. We argue that by using it, deeper understanding and wider possibilities for how to do the design can be achieved, even if we do acknowledge that it is not a trivial problem to embrace and integrate values in design (see [76]). Additionally we wish to point out that due to our choice of theoretical framework, many potential values may have been left unnoticed in this study and the dynamic, evolving and context dependent nature of values remains somewhat neglected (see e.g. [70, 75]).

5.2. Design recommendations for online safety education

While children might not be the most qualified to decide what is important to learn about online safety, they can definitely tell us what excites them, what bores them, and what helps them learn [58]. In our study, children's comments provided many practical design recommendations for education targeted at them. CCI researchers may consider these recommendations in their design aiming at ensuring online safety of children.

Out of the different educational packages they engaged with, the children expressed enjoying the game the most, next came the video, and last the information search and mind mapping. Perhaps reflecting back to the educational packages they enjoyed the most, when they were asked how they would choose to carry out their own education, most suggested to do it either through a video or a game. Watching videos, gaming, and just generally being able to use laptops or smart phones in school, learning about online safety while actually online, was valued as it connected to their media culture and was generally enjoyable for them. It is important to note, however, that the children were easily distracted and annoyed with issues such as video design and game design as well as user interface and control design.

The children also valued sense of achievement as well as self-direction in the sense of independent thought and action through creating and exploring. They valued stimulation through the form of challenges, excitement and novel tasks. This connects back to previous literature, where it has been pointed out that online safety can be seen as an action by children themselves, enabled by their increasing independence and as a developmental process [8]. The more children use the Internet, the better they become in digital literacy and online safety [53]. Because of this, learning while doing and connecting the educational packages to the children's own media culture are certainly important issues.

As a novel and practical aspect, the children in our study wished for more concrete advice instead of vague warnings; for example, in the video they would have hoped for advice on how to check if someone online actually is who she/he says she/he is. This need for concrete advice perhaps reflects back to the cognitive level of a child, needing abstract concepts to be explained in a concrete manner [80]. On the other hand, this could be interpreted as a sign that children fully understand the risks at stake and ask for concrete advice in order to be empowered in the use of online technologies that are important to them. CCI research should be equipped to develop such education that takes into consideration children's age and associated abilities.

Another novel insight relates to children voicing their hope for education where the tone was not judgmental and teaching them also the positive sides of Internet use. This feedback is very valuable; perhaps, we as adults are sometimes motivated by fear when mediating children's online safety, hoping to shield them from anything that would jeopardize their information security [44] and personal safety [45]. The importance of a positive tone became highlighted also when children reflected on what they learned, with many stating that from the video they learned they should never talk to strangers online, or make new friends there. This takeaway likely is not what was intended, as it is widely known that a lot of good things that can come from engaging online [3]. Overall, we see that CCI research could well act as an advocate of more child-friendly online safety education in which the positive side of life online is presented as well as concrete advice given.

In addition to design recommendations from the children, we also add one that emerged indirectly during the workshops. Previous research has recognized that teachers have a central position mediating children's online safety, as they have opportunities to inform [11] and shape attitudes and behavior [11, 83]. Previous literature has identified difficulties associated with promoting the use of digital technologies in schools while safeguarding children [60], including for example that teachers might lack skills for exploring the Internet with children and giving guidance [86], and the lack of guidance on how online safety should be included in teaching [57, 58]. We saw that teacher engagement was very important in providing children the needed Stimulation, and it strongly affected how children in turn engaged with the educational package. Thus, educational packages should appeal also to the teacher and not appear as something extra that they might feel they do not have the time to do [16]. Hence, we argue that there is a need to make the teacher engagement with the education as easy as possible.

To summarize, based on our results, we recommend CCI practitioners and designers to consider the following aspects and values when developing online safety education for children:

1. Integrate aspects of children's own media culture = respect their wish in relation to Tradition and increase Hedonism. It is important to note that children were easily distracted and annoyed when video design, game design, or user interface and control design were not top quality or did not conform to standards, thus decreasing Hedonistic value of the educational package, and Stimulation it provides.
2. Have a positive tone, as there are also valuable things online = respect their wish in relation to Tradition, increase Stimulation.
3. Include more concrete advice instead of vague warnings = increase Self-direction, Security
4. Engage the children in the design and evaluation = increase Self-direction
5. Engage also the teacher = an engaged teacher increases pupil's Stimulation

5.3. Conclusion

There already is plenty of literature on children's online safety education. CCI and HCI researchers have addressed the topic of children's online safety from the perspectives of parental [19, 20] and societal [12, 21] concerns and children's risky actions [1] and identified means by which online risks could be mitigated [22-24] and certain kind of online behavior prevented [22, 25]. Children's online safety is a topic extensively addressed within many other disciplines, too. Many of our findings align with the existing research findings. Some novel findings could also be identified, though – those relating particularly to hearing children's own voices on these issues as well as to values underlying children's choices as regards to their online safety education. Our results show that children want education in ways that provide them with Stimulation and that give them pleasure (Hedonism) as well as a sense of Achievement. However, children also look beyond personal gratification. In the school context they value Benevolence and Conformity: They wish for online safety education that is delivered in a positive tone and that gives concrete advice that helps them preserve the welfare of their close ones (for example classmates or siblings). They also want education that helps them restraint from actions or impulses that could upset or harm them.

Previous studies (i.e. [39, 69]) already show the value of using Schwartz's model of ten universal values in making sense of values relating to children's technology design and use. Even if we do not assume that the model can comprehensively capture all values that can be associated, the model is a useful tool in gaining deeper understanding of the motivation behind children's suggestions therefore helping to create such education that serve children better and align better with their motivations and underlying values.

In the current study we account for children's subjective experience of current educational packages/interventions (what is) as well as their ideas for designing such materials such packages/intervention (what could be). Overall, we see that CCI research could well act as an advocate in the kind of safety education that the children recommend, in which the children's media culture is taken into account, the positive side of life online is presented as well as concrete advice given. The community is already taking steps into this direction, and our research is contributing to that body of knowledge. The CCI community is also particularly well equipped to introduce children as legitimate participants to design their online safety education. This study invited children as native informants, giving them voice regarding how they should be educated about online safety while future CCI research should continue this work and invite children even in a stronger role to devise better means and tools for their education.

In the future, we will definitely continue this work addressing children and their online safety education. Both children's and teachers' underlying values shaping their views and activities related to online safety education would be very interesting to examine in more depth. Particularly value differences and conflicts among children have so far received less attention and should be studied further, using, for example, laddering interviews. Comparing pupils' and teachers' issues, interests and underlying values considering children's online safety education would also be an interesting path for future research, as interesting value conflicts and incompatibilities might be identifiable, as previous CCI research on values already indicates [25, 41].

In the future, we are also interested in inviting children as process designers [87] and protagonists [84, 85] to shape and reflect on their own safety education and urge other researchers to do the same. Perhaps the entire design process could be planned so that children would go through the steps of design, and they would be learning at the same time both about online safety, reflection on technology use, and how to design educational packages. As it is hard to know what you should learn if you do not know what you do not know, children would need to be carefully supported in this, of course.

References

[1] Pater, J. A., Miller, A. D. and Mynatt, E. D. This Digital Life. In *Proc. CHI 2015.* , 2015, 2305-2314. DOI=10.1145/2702123.2702534.

[2] Holloway, D., Green, L. and Livingstone, S. *Zero to eight. Young children and their internet use.* EU Kids Online, London, 2013.

[3] Livingstone, S. and Smith, P. K. Annual Research Review: Harms experienced by child users of online and mobile technologies. J. Child Psychol. Psychiatry, 55, 6 (2014), 635-654. DOI=10.1111/jcpp.12197.

[4] Noppari, E. *Mobiilimuksut: Lasten ja nuorten mediaympäristön muutos, osa 3 [Mobile kids: The change in the media environment of children and youth, part 3].* Tampereen Yliopisto, Tampere, Finland, 2014.

[5] Eurydice Network. *Education on Online Safety in Schools in Europe.* n/a. Education, Audiovisual and Culture Executive Agency, Brussels, 2010.

[6] Livingstone, S. *Children and the internet.* Polity, Cambridge, UK, 2009.

[7] Wisniewski, P., Xu, H., Rosson, M. B. and Carrol, J. M. Adolescent online safety: the "moral" of the story. In *Proc. CSCW 2014.* 2014, 1258-1271. DOI=.

[8] boyd, d. and Hargittai, E. Connected and concerned: Variation in parents' online safety concerns. Policy & Internet, 5, 3 (2013), 245-269. DOI=10.1002/1944-2866.POI332.

[9] Ólafsson, K., Livingstone, S. and Haddon, L. *Children's use of online technologies in Europe: a review of the European evidence base.* EU Kids Online, , 2013.

[10] Donoso, V., Verdoodt, V., Van Mechelen, M. and Jasmontaite, L. Faraway, so close: why the digital industry needs scholars and the other way around. Journal of Children and Media, 10, 2 (2016), 200-207. DOI=10.1080/17482798.2015.1131728.

[11] Hasebrink, U., Görzig, A., Haddon, L., Kalmus, V. and Livingstone, S. *Patterns of risk and safety online.* D5. EU Kids Online, London, 2011.

[12] Hartikainen, H., Iivari, N. and Kinnula, M. Should We Design for Control, Trust or Involvement? A Discourses Survey About Children's Online Safety. In *Proc IDC 2016.* 2016, 367-378. DOI=10.1145/2930674.2930680.

[13] Edgington, S. M. *The Parent's Guide to Texting, Facebook, and Social Media: Understanding the Benefits and Dangers of Parenting in a Digital World.* Brown Books Publishing Group, 2011.

[14] Whitby, P. *Is Your Child Safe Online? A Parent's Guide to the Internet, Facebook, Mobile Phones & Other New Media.* White Ladder Press, 2011.

[15] Hinduja, S. and Patchin, J. W. *Bullying Beyond the Schoolyard: Preventing and Responding to Cyberbullying.* Corwin press, Thousand Oaks, California, 2008.

[16] Hartikainen, H., Iivari, N. and Kinnula, M. Maybe some learn it the hard way: A nexus analysis of teachers mediating children's online safety. In *Proceedings of Scandinavian Conference on Information Systems.* 2017

[17] Hartikainen, H. *Malice in Wonderland : children, online safety and the wonderful world of Web 2.0.* Phd Thesis, 2017.

[18] Hart, R. Children's Participation: From tokenism to citizenship. Innocenti Essays, no. 4(1992), 44.

[19] Ammari, T., Kumar, P., Lampe, C. and Schoenebeck, S. Managing Children's Online Identities. In *Proc. CHI 2015.* 2015, 1895-1904. DOI=10.1145/2702123.2702325.

[20] Ammari, T. and Schoenebeck, S. Understanding and Supporting Fathers and Fatherhood on Social Media Sites. In *Proc. CHI 2015.* 2015, 1905-1914. DOI=10.1145/2702123.2702205.

[21] Badillo-Urquiola, K., Harpin, S. and Wisniewski, P. Abandoned but Not Forgotten: Providing Access While Protecting Foster Youth from Online Risks. In *Proceedings of the 2017 Conference on Interaction Design and Children.* ACM, New York, NY, USA, 2017, 17-26. DOI=10.1145/3078072.3079724.

[22] Renaud, K. and Maguire, J. Regulating Access to Adult Content (with Privacy Preservation). In *Proc. CHI 2015.* 2015, 4019-4028. DOI=10.1145/2702123.2702456.

[23] Wisniewski, P., Jia, H., Wang, N., Zheng, S., Xu, H., Rosson, M. B. and Carroll, J. M. Resilience Mitigates the Negative Effects of Adolescent Internet Addiction and Online Risk Exposure. In *Proc. CHI 2015.* 2015, 4029-4038. DOI=10.1145/2702123.2702240.

[24] Ptaszynski, M., Masui, F., Nitta, T., Hatakeyama, S., Kimura, Y., Rzepka, R. and Araki, K. Sustainable cyberbullying detection with category-maximized relevance of harmful phrases and double-filtered automatic optimization. International Journal of Child-Computer Interaction, 8(2016), 15-30. DOI=http://doi.org/10.1016/j.ijcci.2016.07.002.

[25] Nouwen, M., Van Mechelen, M. and Zaman, B. A value sensitive design approach to parental software for young children. In *Proc. IDC 2015.* 2015, 363-366. DOI=10.1145/2771839.2771917.

[26] Nouwen, M., Schepers, S., Mouws, K., Slegers, K., Kosten, N. and Duysburgh, P. Designing an educational music game: What if children were calling the tune? International Journal of Child-Computer Interaction, 9–10(2016), 20-32. DOI=http://doi.org/10.1016/j.ijcci.2016.10.001.

[27] Mattheiss, E., Regal, G., Sellitsch, D. and Tscheligi, M. User-centred design with visually impaired pupils: A case study of a game editor for orientation and mobility training. International Journal of Child-Computer Interaction, 11(2017), 12-18. DOI=http://doi.org/10.1016/j.ijcci.2016.11.001.

[28] Khaled, R. and Vasalou, A. Bridging serious games and participatory design. International Journal of Child-Computer Interaction, 2, 2 (2014), 93-100. DOI=http://doi.org/10.1016/j.ijcci.2014.03.001.

[29] Hiniker, A., Lee, B., Sobel, K. and Choe, E. K. Plan & Play: Supporting Intentional Media Use in Early Childhood. In *Proc. IDC 2017.* ACM, New York, NY, USA, 2017, 85-95. DOI=10.1145/3078072.3079752.

[30] Sim, G., Nouwen, M., Vissers, J., Horton, M., Slegers, K. and Zaman, B. Using the MemoLine to capture changes in user experience over time with children. International Journal of Child-Computer Interaction, 8(2016), 1-14. DOI=http://doi.org/10.1016/j.ijcci.2016.07.001.

[31] Deater-Deckard, K., El Mallah, S., Chang, M., Evans, M. A. and Norton, A. Student behavioral engagement during mathematics educational video game instruction with 11-14 year olds. International Journal of Child-Computer Interaction, 2, 3 (2014), 101-108. DOI=10.1016/j.ijcci.2014.08.001.

[32] Schuler, D. and Namioka, A. *Participatory design: principles and practices.* L. Erlbaum Associates, Hillsdale, N.J., 1993.

[33] Druin, A. A Place Called Childhood. interactions, 3, 1 (1996), 17-22. DOI=10.1145/223500.223506.

[34] Pinter, A. T., Wisniewski, P. J., Xu, H., Rosson, M. B. and Caroll, J. M. Adolescent Online Safety: Moving Beyond Formative Evaluations to Designing Solutions for the Future. In *Proceedings of the 2017 Conference on Interaction Design and Children.* ACM, New York, NY, USA, 2017, 352-357. DOI=10.1145/3078072.3079722.

[35] Walamies, T. Poimintoja 0-8-vuotiaiden mediasuhteita koskevasta tutkimuksesta [Selections from the study concerning the media relationships of 0-8 year olds]. In Kotilainen, S. ed. *Lasten mediabarometri 2010.* Mediakasvatusseura, Helsinki, Finland, 2011, 9-14.

[36] Staksrud, E., Livingstone, S., Haddon, L. and Ólafsson, K. *What do we know about children's use of online technologies?: a report on data availability and research gaps in Europe [2nd edition].* EU Kids Online Network, London, UK, 2009.

[37] Schwartz, S. H. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. Advances in Experimental Social Psychology, 25, C (1992), 1-65. DOI=10.1016/S0065-2601(08)60281-6.

[38] Schwartz, S. H. Are There Universal Aspects in the Structure and Contents of Human Values? J. Soc. Iss., 50, 4 (1994), 19-45. DOI=10.1111/j.1540-4560.1994.tb01196.x.

[39] Isomursu, M., Ervasti, M., Kinnula, M. and Isomursu, P. Understanding human values in adopting new technology—A case study and methodological discussion. International Journal of Human-Computer Studies, 69, 4 (2011).

[40] Iversen, O. S. and Smith, R. C. Scandinavian Participatory Design: Dialogic Curation with Teenagers. In *Proceedings of the 11th International Conference on Interaction Design and Children.* ACM, New York, NY, USA, 2012, 106-115. DOI=10.1145/2307096.2307109.
[41] Van Mechelen, M., Derboven, J., Laenen, A., Willems, B., Geerts, D. and Vanden Abeele, V. The GLID method: Moving from design features to underlying values in co-design. International Journal of Human-Computer Studies, 97(2017).
[42] Iversen, O. S., Halskov, K. and Leong, T. W. Rekindling Values in Participatory Design. In *Proceedings of the 11th Biennial Participatory Design Conference.* ACM, New York, NY, USA, 2010, 91-100. DOI=10.1145/1900441.1900455.
[43] Magkos, E., Kleisiari, E., Chanias, P. and Giannakouris-Salalidis, V. Parental Control and Children's Internet Safety: The Good, the Bad and the Ugly. In *Proc. ICIL 2014.* 2014, 18.
[44] Harris, S. *Cissp Certification Exam Guide.* Osborne/McGraw-Hill, 2002.
[45] Waters, J., Neale, R., Hutson, S. and Mears, K. Personal safety on university campuses - Defining personal safety using the Delphi method. In *Proc. ARCOM 2004.* , 2004, 411-420.
[46] Nigam, H. and Collier, A. *Youth safety on a living internet.* National Telecommunications & Information Administration, Washington, D.C., 2010.
[47] Hartikainen, H., Iivari, N. and Kinnula, M. Children and Web 2.0: What They Do, What We Fear, and What Is Done to Make Them Safe. In *Proc. SCIS 2015.* , 2015, 30-43. DOI=10.1007/978-3-319-21783-3_3.
[48] Hartikainen, H., Kinnula, M., Iivari, N. and Rajanen, D. Finding common ground: Comparing children's and parents' views on children's online safety. In *Proceedings of British HCI conference.* 2017, 12.
[49] Livingstone, S. and Helsper, E. J. Parental Mediation of Children's Internet Use. Journal of Broadcasting & Electronic Media, 52, 4 (2008), 581-599. DOI=10.1080/08838150802437396.
[50] boyd, d. and Hargittai, E. Facebook privacy settings: Who cares? First Monday, 15, 8 (2010). Available at: http://journals.uic.edu/ojs/index.php/fm/article/view/3086/2589
[51] Tomer, P., Lade, S., Kumar, M. S. and Patel, D. On line social network content and image filtering, classifications. IJERST, 2, 4 (2013), 42-55.
[52] Anthonysamy, P., Greenwood, P. and Rashid, A. Social Networking Privacy: Understanding the Disconnect from Policy to Controls. Computer, 46, 6 (2013), 60-67. DOI=10.1109/MC.2012.326.
[53] Tuominen, S. Toiminnallisuutta nettikasvatukseen [Functionality to Internet education]. In Kupiainen, R., Kotilainen, S., Nikunen, K. and Suoninen, A. eds.*Lapset netissä - Puheenvuoroja lasten ja nuorten netin käytöstä ja riskeistä.* Mediakasvatusseura, 2013, 92-100.
[54] Minton, E. *Social Networking and Social Media Safety.* Rosen Publishig Group, Inc., New York, New York, 2014.
[55] Willard, N. E. *Cyber Savvy: Embracing Digital Safety and Civility.* Corwin, 2011.
[56] Reid, R. and Van Niekerk, J. Snakes and ladders for digital natives: information security education for the youth. Inf Manag Comput Secu, 22, 2 (2014), 179-190. DOI=10.1108/IMCS-09-2013-0063.
[57] Hall, R., Atkins, L. and Fraser, J. Defining a self-evaluation digital literacy framework for secondary educators. Res Learn Tech, 22, 0 (2014), 17. DOI=10.3402/rlt.v22.21440.
[58] Sharples, M., Graber, R., Harrison, C. and Logan, K. E-safety and Web 2.0 for children aged 11-16. J Comput Assisted Learn, 25, 1 (2009), 70-84.
[59] Nguyên, T. T. T. and Mark, L. K. Cyberbullying, Sexting, and Online Sharing: A Comparison of Parent and School Faculty Perspectives. Int J Cyber Behav Psychol Learn, 4, 1 (2014), 76-86. DOI=10.4018/ijcbpl.2014010106.
[60] Ahn, J., Bivona, L. K. and DiScala, J. Social media access in K-12 schools: Intractable policy controversies in an evolving world. Proc Am Soc Info Sci Tech, 48, 1 (2011), 1-10. DOI=10.1002/meet.2011.14504801044.

[61] Livingstone, S., Haddon, L., Görzig, A. and Ólafsson, K. *Risks and safety on the internet: The perspective of European children.* Deliverable D4. EU Kids Online, London, 2011.
[62] The Office of the High Commissioner for Human Rights. Convention on the rights of the child. (1989).
[63] Scaife, M., Rogers, Y., Aldrich, F. and Davies, M. Designing for or Designing with? Informant Design for Interactive Learning Environments. In *Proc. CHI 1997.* ACM, New York, NY, USA, 1997, 343-350. DOI=10.1145/258549.258789.
[64] Friedman, B., Kahn, P. H., Borning, A. and Huldtgren, A. Value sensitive design and information systems. In Doorn N., Schuurbiers D., van de Poel I. and Gorman M. eds.*Early engagement and new technologies: Opening up the laboratory.* Springer, Dordrecht, 2013, 55-95.
[65] Miller, J. K., Friedman, B., Jancke, G. and Gill, B. Value Tensions in Design: The Value Sensitive Design, Development, and Appropriation of a Corporation's Groupware System. In *Proceedings of the 2007 International ACM Conference on Supporting Group Work.* ACM, New York, NY, USA, 2007, 281-290. DOI=10.1145/1316624.1316668.
[66] Flanagan, M., Howe, D. C. and Nissenbaum, H. Embodying values in technology. In Anonymous *Theory and practice; Information Technology and Moral Philosophy.* Cambridge University Press, 2008, 322-353.
[67] Cockton, G. Designing Worth is Worth Designing. In *Proceedings of the 4th Nordic Conference on Human-computer Interaction: Changing Roles.* ACM, New York, NY, USA, 2006, 165-174. DOI=10.1145/1182475.1182493.
[68] Leong, T. W. and Iversen, O. S. Values-led Participatory Design As a Pursuit of Meaningful Alternatives. In *Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction.* ACM, New York, NY, USA, 2015, 314-323. DOI=10.1145/2838739.2838784.
[69] Kinnula, M., Iivari, N., Isomursu, M. and Kinnula, H. Socializers, achievers or both? Value-based roles of children in technology design projects. International Journal of Child-Computer Interaction, 17(2018). Available at: http://www.sciencedirect.com/science/article/pii/S2212868916300939.
[70] Le Dantec, C. A., Poole, E. S. and Wyche, S. P. Values As Lived Experience: Evolving Value Sensitive Design in Support of Value Discovery. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.* ACM, New York, NY, USA, 2009, 1141-1150. DOI=10.1145/1518701.1518875.
[71] Manders-Huits, N. What Values in Design? The Challenge of Incorporating Moral Values into Design. Sci. Eng. Ethics, 17, 2 (2010), 271-287. DOI=10.1007/s11948-010-9198-2.
[72] Kujala, S. and Väänänen-Vainio-Mattila, K. Value of Information Systems and Products: Understanding the Users' Perspective and Values. Journal of Information Technology Theory and Application (JITTA), 9, 4 (2009), 23-39.
[73] Iivari, N., Kinnula, M. and Kuure, L. With best intentions - a Foucauldian examination on children's genuine participation in ICT design. Jour Inf Tech & Peop, 28, 2 (2015), 246-280. DOI=10.1108/ITP-12-2013-0223.
[74] Zaman, B. and Abeele, V. V. Laddering with Young Children in User eXperience Evaluations: Theoretical Groundings and a Practical Case. In *Proceedings of the 9th International Conference on Interaction Design and Children.* ACM, New York, NY, USA, 2010, 156-165. DOI=10.1145/1810543.1810561.
[75] Halloran, J., Hornecker, E., Stringer, M., Harris, E. and Fitzpatrick, G. The value of values: Resourcing co-design of ubiquitous computing. CoDesign, 5, 4 (2009), 245-273. DOI=10.1080/15710880902920960.
[76] JafariNaimi, N., Nathan, L. and Hargraves, I. Values as Hypotheses: Design, Inquiry, and the Service of Values. Design Issues, 31, 4 (2015), 91-104. DOI=10.1162/DESI_a_00354.
[77] Mediataitokoulu. Nettielämää - Olenko ainoa? [Life Online - Am I the Only One?]. 2017, 3/10 (2015).
[78] Ombudsman for Children and Agora Game Lab. Seikkailu Sisunmaassa - A game about children's rights. 2017, 3/10 (2009).

[79] 4H Organization of Finland. Viisaasti verkossa [Wisely online]. 2017, 3/10 (n.d.).
[80] Druin, A. The role of children in the design of new technology. Behav Inf Technol, 21, 1 (2002), 1-25. DOI=10.1080/01449290110108659.
[81] Fails, J. A., Guha, M. L. and Druin, A. Methods and techniques for involving children in the design of new technology for children. Foundations and Trends in Human-Computer Interaction, 6, 2 (2012), 85-166. DOI=10.1561/1100000018.
[82] Miles, M. B. and Huberman, A. M. *Qualitative Data Analysis: An Expanded Sourcebook.* Sage Publications Inc., Thousand Oaks, California, 1994.
[83] Shin, W. and Lwin, M. O. How does "talking about the Internet with others" affect teenagers' experience of online risks? New Media & Soc, 19, 7 (2016), 1109-1126. DOI=10.1177/1461444815626612.
[84] Iversen, O. S., Smith, R. C. and Dindler, C. Child As Protagonist: Expanding the Role of Children in Participatory Design. In *Proc. IDC2017.* ACM, New York, NY, USA, 2017, 27-37. DOI=10.1145/3078072.3079725.
[85] Iivari, N. and Kinnula, M. Empowering Children Through Design and Making: Towards Protagonist Role Adoption. In *Proceedings of the 15th Participatory Design Conference: Full Papers - Volume 1.* ACM, New York, NY, USA, 2018, 16:1-16:12. DOI=10.1145/3210586.3210600.
[86] Anastasiades, P. S. and Vitalaki, E. Promoting Internet Safety in Greek Primary Schools: the Teacher's Role. J Educ Techno Soc, 14, 2 (2011), 71-80.
[87] Schepers, S., Dreessen, K. and Zaman, B. Rethinking children's roles in Participatory Design: The child as a process designer. International Journal of Child-Computer Interaction, (2017). Available at: http://www.sciencedirect.com/science/article/pii/S2212868916300848.

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We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

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