Centre for Policing Research and Learning

The Open University

Children's Online Safety:

Prospecting Chatbots for Tackling Online Abuse

Final Report

Dr Lara Schibelsky Godoy Piccolo

Prof Harith Alani

KMi
Knowledge Media Institute

June 2020

Executive Summary

Chatbots are computer programs that simulate human conversations, and could be designed as communication channels to support young people who feel they have been victims of online abuse. With a socio-technical approach, this research investigated how such a chatbot should be formed, from the perspective of potential users. More than 100 school children aged 11-17 years old took part in one of 8 workshops we organised in schools in London and Milton Keynes from October to December 2019. The participants shared their views about using such a technology and performed stories with Lego figures to simulate situations in which the chatbot could help a young person facing a stressful situation online. The analysis of surveys and co-created material in this project led to answers to these research questions:

⇨ **How do potential users perceive interaction with a chatbot?**

The majority (82%) of participants expressed a positive feeling towards having a chatbot for tackling online abuse and, in the event of being abused, a chatbot by Childline is their first preference when looking for help beyond their families. Cyberbullying, blackmail/threatening and sexting were the most frequent types of abuse mentioned, with cyberbullying being the most common for primary students and sexting for secondary school students. Lack of judgment and no embarrassment from the users were the most positive aspects acknowledged for using the bot. Mainly younger participants felt the chatbot could be the help they need when parents let them down or are unable to help. Fear of private information leakage was the main concern regarding using it.

⇨ **What are the adequate features and platforms?**

The chatbot should assume that the user will end the conversation ready to take the appropriate action, be it just a protective measure like changing privacy settings, talk to a Childline counsellor, or an active step such as reporting someone to CEOP/Police.

Users expected the chatbot to help them mainly to: i) assess the severity of the situation; ii) raise their confidence to take any further action; iii) support them emotionally; and iv) provide advice for taking next steps.

Primary students are more vulnerable in online gaming environments than in social media platforms, while secondary students are more exposed in social media. Therefore, cross-platform messaging and Voice over IP (VoIP) platforms such as WhatsApp could fit the criteria for ubiquitousness and encryption. Childline/CEOP websites should also host the chatbot since these websites were considered the typical place where users would look for it at first.

⇨ **What socio-technical elements should be considered to deploy a chatbot as a service?**

Dialogue: The chatbot should communicate in first person form, in casual English, with contractions, using plain language suitable to children from 11 years old. The vocabulary should be adjusted to suit younger users when referring to the online abuse.

Ethics: The chatbot should initially inform how it operates, what sort of data could be stored, what institutions are behind it, the eventual availability of a counselor in case of urgency, and quickly assess whether the request is within its scope in order to avoid frustrating the user.

Privacy: Private information (name, address, etc) should not be stored by the chatbot. The conversation should be encrypted, and the user should be informed of that. The only record maintained is whether it is a recurrent user or not.

Psychological support: the chatbot should target: i) gaining users' trust in the initial steps of the conversation; ii) making sure the user is comfortable during the conversation; iii) ensuring that the user is feeling good emotionally when the conversation finishes.

More guidance for building the dialogues and the extensive list of socio-technical requirements are described in Sections 4.3 and 5.

1. Introduction

1.1   Online Abuse in the UK

Online abuse happens when someone acts in a harmful way, causing someone else distress, on social media or on any digital communication, such as email, chats, games, and comments on live streaming sites. According to the National Society for the Prevention of Cruelty to Children (NSPCC 2019), charity championing child protection in the UK, children and young people may experience several types of online abuse, including:

- Bullying/cyberbullying that comprises sending threatening or upsetting messages, sharing embarrassing or malicious images or videos, trolling on social networks, encouraging self-harm, etc.;
- Sexting which refers to pressure or coercion to create sexual images;
- Grooming, when perpetrators build a trusting relationship with the children in order to abuse them sexually.

In the UK, these types of online abuse can be classified as criminal offences when associated to hate crimes or sexual abuse. However, with regards to grooming, it can be difficult for the police and legal professionals to make legislation apply since the content of messages sent by perpetrators usually targets building trust and rapport with a child, therefore might not clearly evidencing the criminal intention.

According to NSPCC (Bentley et al 2019), it is hard to know how many children and young people are affected by online abuse, mainly because many refrain from telling anyone due to feeling ashamed or guilty, not knowing whom to talk to, or simply not realising that they are being abused. It is acknowledged, though, that the number of reports has continuously increased. Contacts to the NSPCC helpline where online sexual abuse was the main concern increased 19% from 2018 to 2019.

A recent survey reported by NSPCC (Bentley et al 2019) suggests that 200,000 young people may have been groomed on social networks until 2019 and 21% of surveyed girls aged 11 to 17 had already received a request for a sexual image or message. Considering that 90% of children at this age have a social media account, these numbers can be alarming.

The 2019 NSPCC report (Bentley et al 2019) also reveals that police recording practice has recently changed to allow an offence to be flagged as an online crime if it is committed, in full or in part, through a computer, computer network or other computer-enabled devices. However, the report points out that this flag is still underused. For this reason, it is expected that the number of online child sexual offences will continue to increase as the flag is more routinely used by police forces.

1.2 Research overview

Chatbots are computer programs designed to simulate a human conversation. Chatbots can be an alternative solution for tackling online abuse either by preventing it from happening or stopping it. They can be available on a messenger platform for young people to ask for advice, report suspicious conversations, and to engage with educational content.

Situated in the human-computer interaction domain, this research has a socio-technical approach to investigate the viability of using chatbots as a communication channel between the Police, the NSPCC/Childline or another related stakeholder to advise children feeling they have been a victim of online abuse.

Involving young people as co-creators of a chatbot, we organised 8 workshops in primary and secondary schools and engaged with more than 100 pupils in total from 11 to 17 years old to share their perceptions, expectations and to co-design solutions. Our methodology relied on storytelling

and Lego, simulating the dialogue between users and the chatbots in a situation online that they found uncomfortable.

1.3 Partnerships

To perform this research, strategic partnerships have been built to assess current support to children on online safety and to approach schools interested in running workshops. The partners were:

Childline is the NSPCC's national service for children and young people, which provides a safe and confidential space for them to work through a wide range of issues. In 2018/19, Childline delivered 1,700 counselling sessions. As one of the main stakeholders in this research domain, the Childline team was approached to share their interests and concerns regarding having a chatbot deployed, which could increase their capacity in assisting children who are feeling victims of online abuse. Childline's concerns were translated into research questions to drive the data collection.

Originally conceived by Bucks Fire & Rescue Service and Thames Valley Police, the Safety Centre Hazard Alley Interactive Education Centre in Milton Keynes offers an interactive installation to introduce children to risks, dangers and hazards in a totally safe environment. CEOP-trained teachers offer Internet safety training either on-site or as sessions in primary and secondary schools in the region. The Internet safety sessions are delivered to over 5,000 children per academic year. The Internet safety team actively collaborated with this research by integrating the workshop dynamics with their online safety teaching, producing data collection tools to be used by the workshops' participants, delivering online safety content part of the workshops and aliasing with primary and secondary schools in Milton Keynes to host the activities.

The Diana Award is a charity operating across the UK, supporting young people with mentoring and anti-bullying programmes. The Diana Award Anti-Bullying Campaign focuses on changing the attitude surrounding bullying both across the UK and beyond. The Anti-Bullying team supported this research as gatekeepers, exposing the relevance of the study and inviting strategic schools, focusing on online safety in the London area to host workshops.

2   Chatbots state-of-the-art

As described in Piccolo et al (2018), technical advances in Artificial Intelligence and Natural Language Processing (NLP) are favouring the design and adoption of conversational interfaces. Not only the well-known voice-based services like Amazon Alexa, Siri and Google Home are becoming increasingly popular, but the mainly textual chatbot like those based on the Facebook Messenger platform has also been extensively explored commercially. Facebook Messenger, Skype, Slack, etc. together are already hosting more than a million chatbots. Facebook Messenger alone hosts more than 300,000 of them (Jain et al 2018). These numbers are expected to have increased, as a report on emerging technologies and marketing by Oracle (2018) reveals. They found that 80% of consumer brands will be using chatbots for customer interactions in the next few years. In this context, the chatbots are mostly utility-driven, designed to provide specific services like the pioneer bot to assist with booking flights[1], or providing e-gov support[2].

The literature analysis in Computing described in Piccolo et al (2018) suggests that technical challenges of creating chatbots have been a research priority, and the efforts are not balanced when it comes to understanding the real impact of the technology to the users and to society. Although the engagement potentials of the chatbots have already been explored, how to design them to promote impact and a consequent "social good" is an emerging topic that deserves more attention (Følstad et al 2018). As Brandtzæg and Følstad (2018) state, deploying a chatbot as a service interface is not only a matter of developing a new front-end, because users have new motivations and patterns of use in this case. Without understanding the people who use the chatbots, how they would use it, their goals and expectations, it is hard to predict a sustainable adoption and impact of this technology.

The literature reveals several gaps in the user-centred research on how to properly design and evaluate chatbots with the current limitations of technology in terms of natural language processing and dialogue context without compromising trustworthiness. According to the Diffusion of Innovation model by Rogers (2003), innovators and early adopters of a technology typically have a high tolerance for risk and complexity. However, the majority of people tend to have different expectations and thresholds when adopting it (or not). For this reason, we argue for the importance of boosting user-centred research when pursuing real societal impact and a long-lasting service. The main challenges associated to the design of a chatbot include (Piccolo et al 2018):

Adequate interaction style: addressing specific platforms (and users' motivations), like Facebook, Snapchat, games, etc.; the expectation of the target audience in terms of vocabulary, formality, etc.; context of use and ethical boundaries, when using AI, etc.

Appropriate tasks: there is a recognised potential for using chatbots for fulfilling emotional needs, addressing sensitive topics with privacy, and in humanitarian contexts. Further research is necessary for assessing the real value and impact of a diversity of applications to specific target audiences, especially those that touch emotional aspects of the users or aim to promote positive social changes.

Trust: being trustworthy is still an aspiration for most of the chatbots mainly due to the current limitations associated with conversational interfaces. Guidelines to keep an acceptable user experience in such scenario have emerged, but additional research should include guidance on how to communicate chatbots capabilities to (new) users and addressing limits of users' tolerance and impact of conversation breakdown on technology acceptance.

---

[1] KLM Blue Bot: https://bb.klm.com/

[2] Emma, Virtual Assistant of the US Citizenship and Immigration Service: https://www.uscis.gov/emma

3   Research Methodology

3.1   Research questions

The set of research questions below drove the work in this project:

- ⇨   How do potential users perceive interaction with a chatbot?
- ⇨   What are the adequate features and platforms?
- ⇨   What socio-technical elements should be considered to deploy a chatbot as a service?

Answers to these questions should lead to evidence-based guidance for a chatbot development, providing requirements towards trustworthiness, chatbot identity and personality, and elements and formality tone of the dialogue.

In addition, the following set of questions raised by the Childline team have been addressed:

- ●   Do they think it is a good idea to have a chatbot on the Childline website?
- ●   In what situations do you think a chatbot would be helpful?
- ●   In what situations do you think a chatbot might not be helpful?
- ●   What would make them use a chatbot on the Childline website?
- ●   What would put them off using a chatbot on the Childline website?

3.2   A "Make" method for generative research

Fully engaging young people in research in order to reach their inner thoughts requires going beyond traditional methods of qualitative research such as interviews and observations (Sanders 2018). "Make" methods (Sanders and William 2002) stand as an approach to generative research for engaging participants in exercises likely to activate their feelings, enable articulation of ideas, therefore, boost participant's creativity. The steps to progress through this creative process include:

- -   Immersion: it should take place in the comfort of the participants' usual surroundings before the main data collection session. It includes documenting thoughts, feelings, and ideas about the experience being investigated.
- -   Technique: a generative technique like modelling, charting, and cognitive mapping to be used in one session.
- -   Creating and piloting toolkits: toolkits, or the collection of stimuli given to the participants.

For immersion, the workshops took place in schools as an activity part of pupils' learning experience. The co-creation activity was preceded by a regular lesson on online safety, where fictional stories of young people experiencing online abuse were presented and debated. In addition, the definition and functioning of chatbots were briefly explained.

After the lessons, participants discussed in groups their perceptions on potentials and drawbacks of having a chatbot to tackle online abuse. Using Lego figures (toolkit), the generative activity of creating and piloting took place aiming for recording short sketches of stories involving online abuse with a young person as a victim that requested the support of a chatbot.

3.3   Ethical considerations

Before approaching the schools and partners, this research project was reviewed by, and received a favourable opinion, from the OU Human Research Ethics Committee - HREC reference number: HREC/3048/Piccolo.

Addressing a possibly sensitive topic as online grooming, this research invited young people to get involved as co-designers instead of asking them to share any personal experience. Specific methods to build rapport and engage with children have been taken from the literature (Sanders 2018; Designing for Children's Right 2019), also for integrating children's rights and ethics into the design

process. Although the activities with children did not address any personal information or report, the topic could potentially trigger some spontaneous reaction from participants that eventually had a related experience. This risk was discussed with the school and partners in advance in order to have some local staff available prepared to deal with the situation. The responsible researcher has received the OU online Safeguarding training and obtained the Disclosure and Barring Service.

Based on their experience, the Safety Centre instructed to adopt a different vocabulary when referring to online abuse to primary and secondary school pupils. The term 'worrying situation online' was then adopted for primary school, while for secondary school students the terms grooming and sexual abuse were used without restrictions.

3.3.1   Recruitment

The schools have been approached by the partners, in Milton Keynes by the Safety Centre and in London by the Diana Award Foundation. They were informed that the study had been granted the ethical approval and received a copy of the following documents: Information Sheet for Parents, Informed Consent Form, leaflet for the participant children informing about the right to withdraw, and a copy of the surveys.

The schools contacted the parents in advance and asked for the signed consent term in order to allow the children's participation. The forms were kept in the schools' premises. There is no data collected that can be used to identify the participants.

3.4   Workshops programme and resources

As a pre-workshop activity, the participants were invited to fill an anonymous survey on their social media usage, perception of online safety issues within their circle of friends and what they would do if something worrying happens to them online.

The workshop programme consisted of an interactive lesson on online safety followed by the co-creation activity. It was designed to last 2 hours in total and followed this structure:

1. Introduction on online safety delivered by the Safety Centre following their usual methodology that engages the pupils on discussions and reflections on their personal experiences
2. Exhibition of an educational video by CEOP ThinkuKnow programme featuring a young person victim of online abuse. For primary schools, the video Jigsaw Assembly (Fig 1) that illustrates the threats of exposing personal information online was exhibited. The secondary school students watched the CEOP's video Consequences, which is more suitable for 11-16 years old.

Fig 1 – Screenshots of CEOP's videos used to inspire participants
of Primary and Secondary school students

3. Brief explanation of what a chatbot is with examples and the illustration of a typical dialogue, as illustrated below.
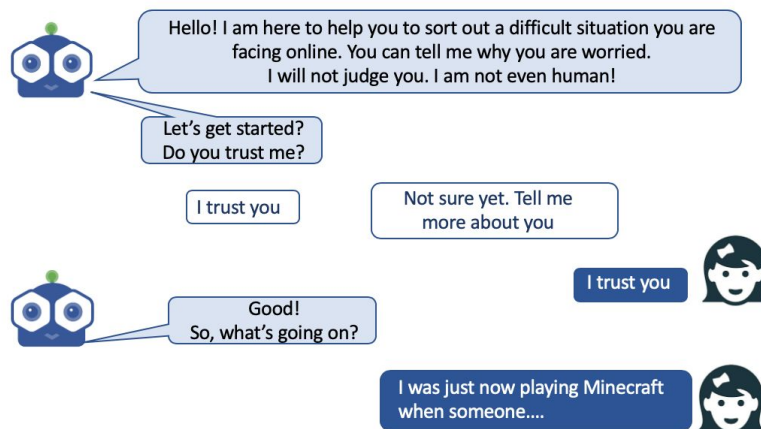
Fig 2 – Illustration of a typical dialogue by a chatbot

4. Activity on requirements for a chatbot targeting specifically the research questions posed by Childline. The participants used a A3 printed form like the one illustrated below to discuss and fill it in groups of 4 or 5.

Fig 3 – Chatbot requirements form

5. Storytelling and sketch recording using Lego figures as detailed in the next section.
6. Post-activity survey. Individually, the participants were invited to fill a quick survey anonymously on what platforms of websites they would expect to find a chatbot for tackling online abuse and whether they would use it or not.

3.4.1 Sketch recording using Lego figures

The sketches were recorded in a different room, with groups of 4 to 6 children working on that together. They have used a small stage suitable for stop motion movies and the recording focused strictly on the hands of the participants and Lego figures, not capturing their faces. Assuming that starting the activity with an idea could be an issue that would consume most of the time available, the chat logs below (Fig 4) were available as an optional and inspirational tool. The examples only address situations of online abuse similar to those addressed in the videos exhibited, not entering on the merit of using the chatbot, which had to be developed by the groups.

Each group received a toolkit with a blank A4 sheet to set the dimension of the stage and a kit with 5 or 6 random Lego figures and accessories. Each toolkit had at least one robot to be featured as the chatbot and one policewoman (Fig 5).
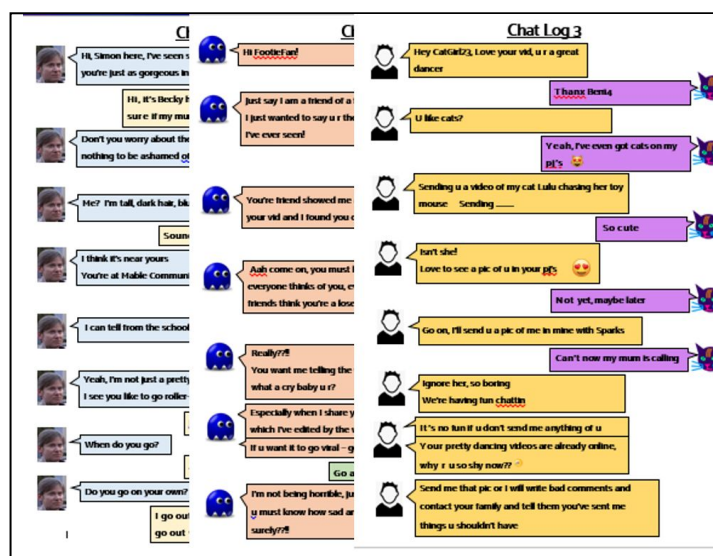

Fig 4 – Inspirational initial logs

Fig 5 – Example of Lego figures distributed

3.5   Execution

The research involved a total of 110 participants, 56 primary school students from 7 to 11 years old and 54 students in secondary schools aging from 11 to 17. The workshops setup are detailed in the table below.

Table 1 - Workshops details

School	Level	Number of workshops	Total of participants	Date
Caroline Haslett Milton Keynes	Primary	2	56	21/Oct/19
Alec Reed Academy Northolt, London	Secondary	2	18	31/Oct/19
Lord Grey Academy Milton Keynes	Secondary	4 in 2 days	36	16-17/Dec/19

In all workshops, the students worked in groups of 4 to 6 participants. The surveys, though, were answered individually. Each workshop lasted 2 hours in total.

4   Results

4.1   Surveys

The charts below depict the results obtained for each survey question. The percentages above the columns refer to the results considering all the participants, while the numbers in the columns are the frequencies or percentages of primary and secondary school students. The main findings are listed for every set of data.

4.1.1   Friends online and perception of safety

- Primary school students are more vulnerable in online gaming environments than in social media platforms.
- 43% of the respondents in primary selected Roblox as a chatting platform; 30% Fortnite and 23% Minecraft.
- WhatsApp, Instagram and Snapchat are the most prominent platforms for students in the secondary schools.
- Half of the participants declared they made new friends online through a diversity of games and social media, with a slight dominance of Roblox to this end.
- The majority of the participants (aprox. 65%) feel safe or feel they can handle any threat online.
- The perception of bullying and grooming among the circle of friends is equivalent across age groups, with around 40% acknowledging it happens a lot or that they heard stories about both types of online abuse.
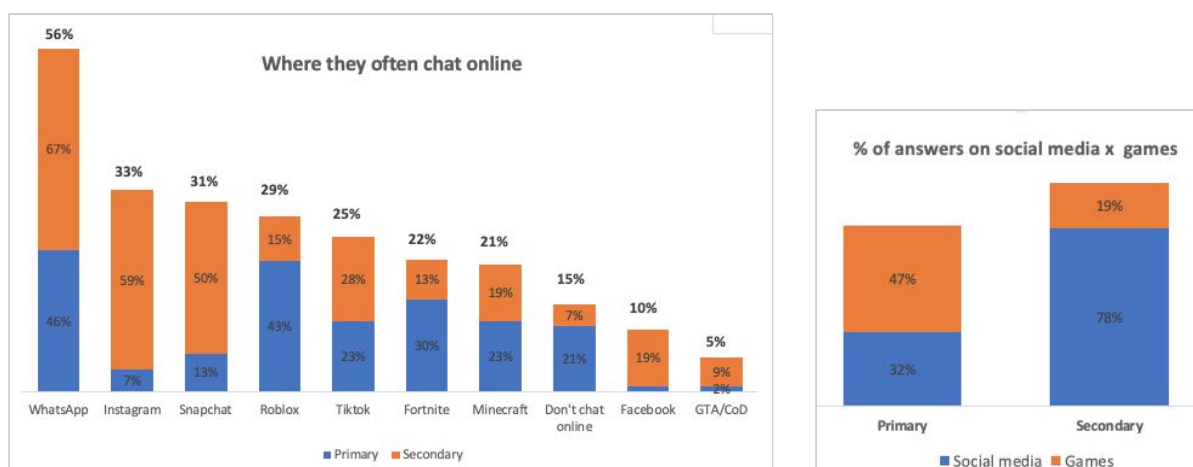
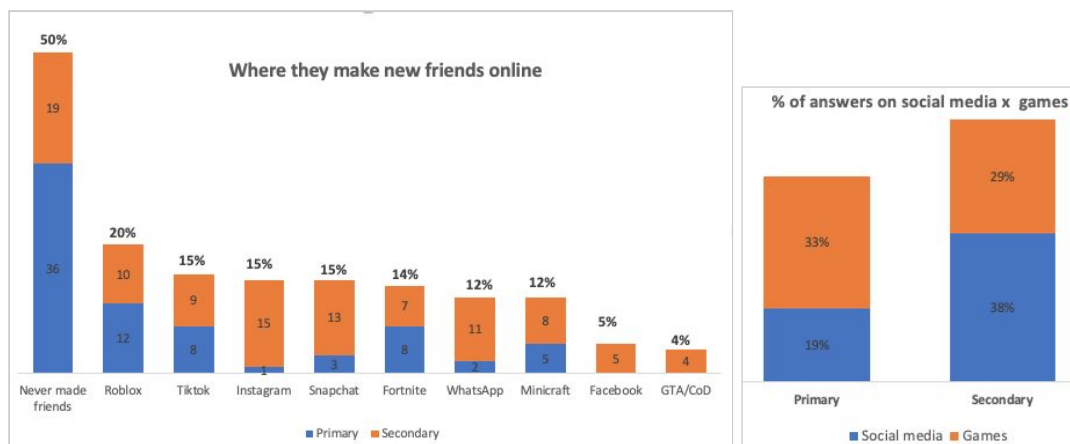Fig 6 (a) and (b) - Where the participants chat online

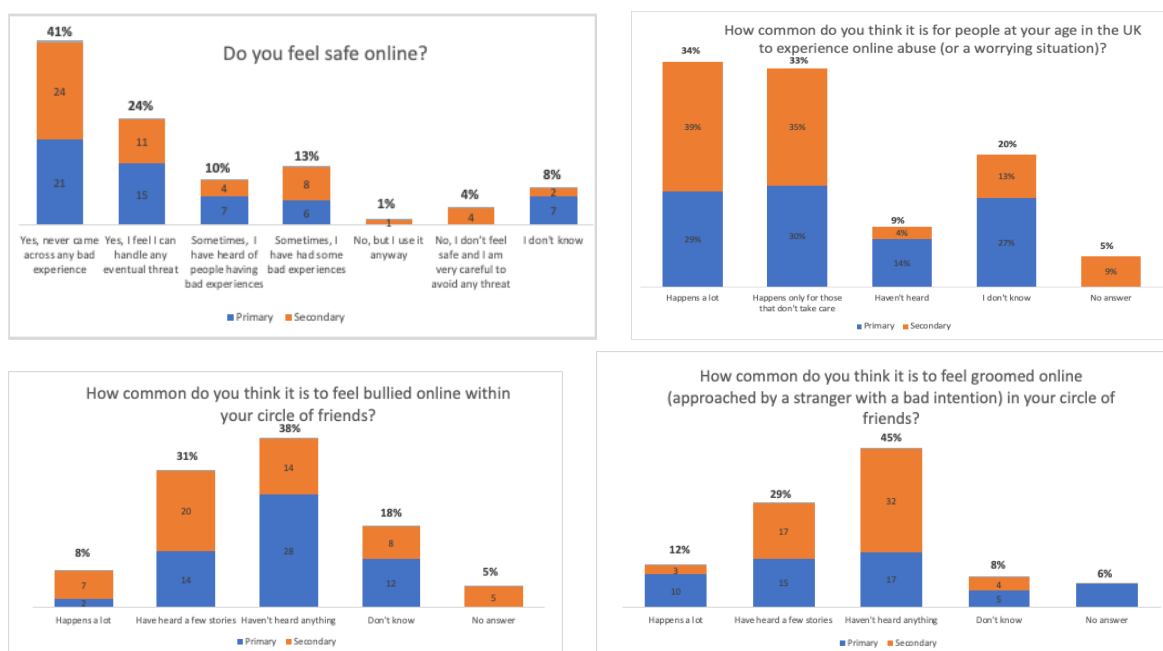Fig 7 (a) and (b) - Where the make new friends online

Fig 8 (a)(b)(c)(d) - Responses to the initial survey questions

4.1.2 The potential role of the chatbot

- Only 11% of the participants declared they have used a chatbot before.
- 82% of the participants expressed a positive feeling towards having a chatbot for tackling online abuse: 46% loved the idea of and 35% liked it and believe people will feel comfortable with it.
- Those that did not express positive feelings were 13%, including 6% that did not like it or feel uncomfortable, and another 7% were undecided.
- In the event of being abused, the chatbot by Childline is the first resource in the preference (9% of the responses) when asking for specialised help against calling Childline, Police chatbot, information online, etc.

- Relying on a trusted person is the main preference, with the family coming first with 25% of the responses. While Primary school students would also rely on the teacher to a certain extent, older students tend to prefer the friends instead.
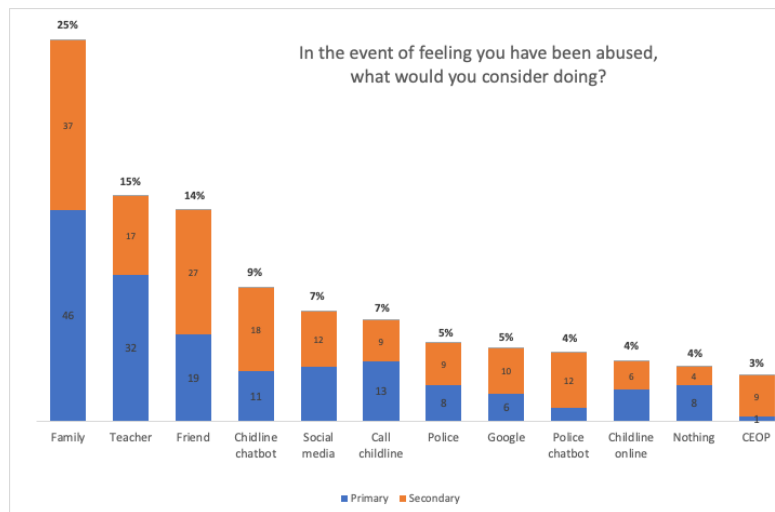

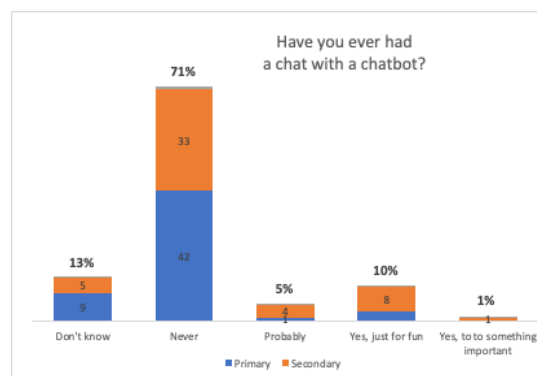Fig 9 - Where they would look for help if feeling abused

Fig 10 - Previous experience with a chatbot
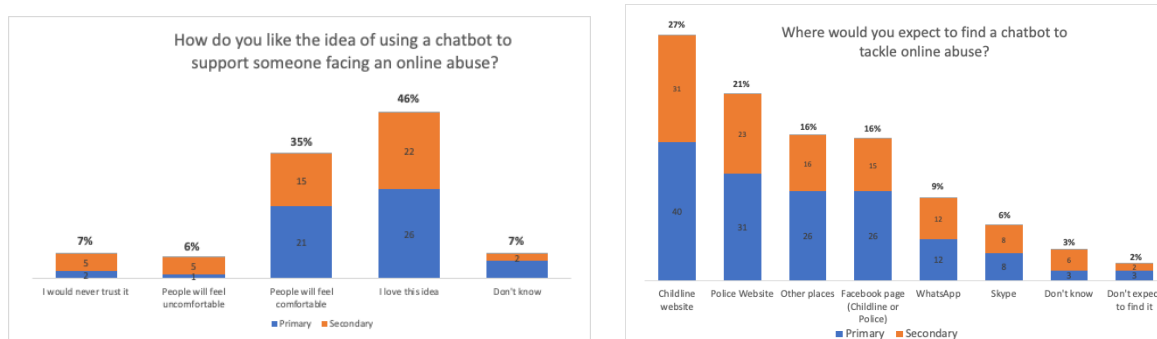
Fig 11 (a) and (b) - Perception and expectation towards using a chatbot

4.2 Sketches

A total of 22 sketches were recorded performing the stories in which the chatbot provided some support to children suffering some form of online abuse. Three of them are illustrated with the snapshots below (Fig 12). 9 were created by primary school students and 13 by secondary, a higher number since they have worked in smaller groups of 4 people each. The videos have been transcribed and the scripts coded using Nvivo according to types of abuse, actions taken by the

7

chatbot, characteristics of the dialogue and roles of stakeholders including the trusted adult, Police, CEOP, friends, etc.

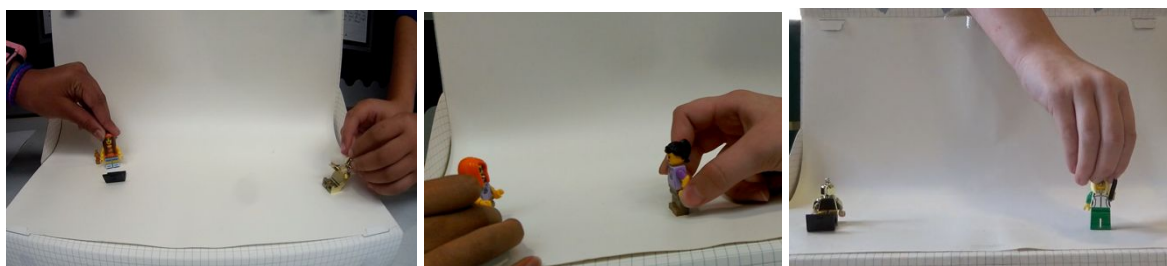Fig 12 - Snapshots of three sketches recorded

The Primary school videos lasted on average 3min (max 5:48, min 01:50), and Secondary 2min each (max. 5:20, min 0:39s). Only one story did not properly address the use of a chatbot.

4.2.1 Perception of online abuse

Table 2 below summarises the chat logs selected and applied by the groups, evidencing that they were an important resource for the primary students, but not considered necessary for most of the secondary.

Table 2 - Workshops details

Chatlog		Frequency
Primary	Cyberbullying	4
	Blackmailing/threatening with a picture	4
	No chatlog	1
Secondary	Cyberbullying	1
	Sexting	3
	No chatlog	9

Table 3 summarises the references to the online abuse in the stories, including those not based on chat logs. The frequency of the topic is also presented and examples of the dialogue when referring to the abuse are provided.

Table 3 - References to online abuse in the stories

Reference to Online Abuse	Primary	Secondary	Examples
Cyberbullying	5	2	*Making fun of me* -- *This boy on Instagram is making me feel horrible about myself*
Blackmail/threatening	4	3	*Send something otherwise he will make bad comments* -- *I've been blackmailed on YouTube video, he threatened that he would share a video of me*
Sexting	-	6	*I've been going for pressure with this person now he won't leave me alone*
Non-desired Pregnancy	-	1	*I am pregnant. My boyfriend just hit me, and he doesn't want me to keep the baby*
Sexual harassment	-	1	*You are arrested for sexual harassment*

Still referring to the abuse, 8 stories mentioned the perpetrator: 5 referring to a stranger or random person; 3 to boyfriend or girlfriend. And 6 stories described the platform where the crime took place: 3 Instagram; 1 Facebook; 1 YouTube; 1 TikTok.

4.2.2 Chatbot Actions

Giving advice was the predominant action performed by the chatbot, present in 20 out 22 videos. In 3 stories the chatbot also called Childline directly, the Police or CEOP. As described in the Fig 13 below, tell the trusted adult and call Childline are the top advices, followed by using the CEOP button and blocking the perpetrator.
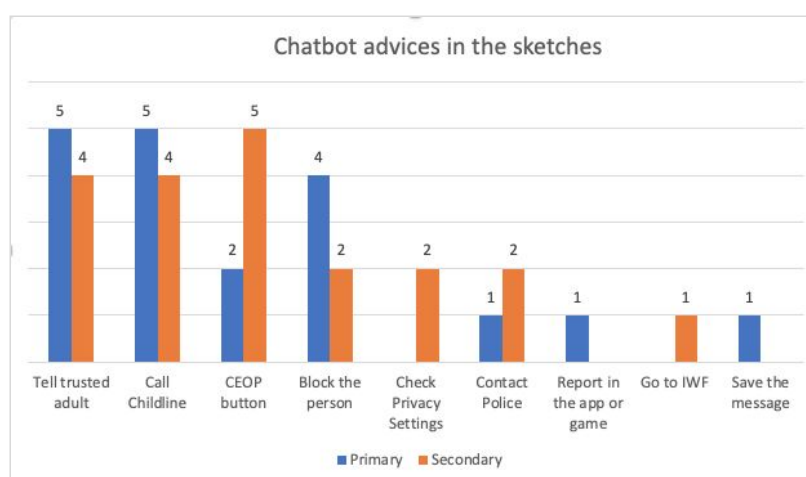

Fig 13 - List of advices provided by the chatbot in the stories

In some of the stories, the action continued after the chatbot user received the advice. In all sketches made by primary school students, the chatbot had the following action, and in 30% of the stories created by secondary school students. The actions taken are described in the table below, including who took the action, if the chatbot, an adult of the user and the number of occurrences in the primary (P) and secondary (S) videos.

Table 4 - Action taken in the stories

Follow up action taken by	Called Police/CEOP	Called Childline
Chatbot User	4 (2P,2S)	2P
Parent	2P	1P
Chatbot itself	2(1S,1P)	1S

In 7 stories, the perpetrator was then localised and arrested by the Police.

4.2.2.1 Trusted adult and friends

As further described in Table 5, in the sketches, the pretend friends appear either using the chatbot together with the victims or suggesting they use the chatbot.

Parents or trusted adult have a strong presence in the videos but, in many cases, the chatbot user explicitly refuse to share the issue with them either to avoid disappointment "*No, I am worried*

because they might be sad at me" or for embarrassment "*I am not really brave enough for doing this and tell a trusted person*".

In 5 videos, though, the pretend parents let the child down by either ignoring the issue or simply sending them back to the chatbot. For primary school students, some pretend parents participated in the story either using the chatbot with the child or calling Childline or the Police together.

Table 5 - Role taken by the stakeholders in the stories

Stakeholder	Role taken	Examples
Pretend Friend	Using the chatbot together (1P) Suggests chatbot (1P, 1S)	*(a friend comes) Friend: how are you ok? I just saw what happened* *It's fine, I just don't want to talk about it, I just can't talk face to face, it's so embarrassing* *Friend: If you can't speak to me there's always chatbot* *What is chatbot?* *Friend: It's a robot you can speak about your problems anonymously*
Pretend Parent	**Active response:** Call Police together with the child (1P); Went back to the chatbot with the child (1P)	*Dad: let's go talk to the chatbot* *Hello chatbot, I am back, this time with my dad* *My dad is wondering if I should go to the CEOP website*
	Negative response: Ignored and sent the child back to the chatbot (3P); Didn't notice the online abuse issue (1S); Tell the child to call Childline (1P)	*Hi Mum, we need to tell you something* *The girls, the people from our school they have been calling me xx, making fun of me for the videos I've done. I went to chatbot and he said I need to tell you.* *Mom: I can't do anything, so just go back to chatbot and see what he can do about it* *--* *Dad, I told a chatbot that I got bullied online* *Dad: ok, what did it say?* *It told me to me to get you* *I don't know what to do. Go and ask the chatbot* *--* *Mom: Hello honey, do you need something?* *I really need your help, I accidentally friended a random person* *Mom: Sorry, I am cooking right now. Ask someone else* *I am going to use the chatbot*

In two stories the victim repeated the explanation of the situation 3 times, to the parents, to the chatbot and finally to the Police.

4.2.3 Dialogues

The dialogues have been analysed as described in the next sequence of tables. This qualitative analysis takes into account relevant patterns in vocabulary and structure, the frequency some of the occur and notable differences in approach when comparing dialogues by primary schools students and secondary. Some colour schemes have been applied to identify parts of the dialogue in the examples.

Prospecting Chatbots for Tackling Online Abuse

The analysis is grounded on the typical sequence in the dialogue between the user and the chatbot found in most of the stories:

1. Greetings: *hi, hello…*
2. Introduction: *I am a robot that…*
3. Gain user's trust: *You can trust me. Everything will be kept between you and me, secretly*
4. Approaching the problem/offering help: *How may I help you today?...*
5. User describing the problem: *I was chatting…*
6. Advices: Suggest actions/ask what has been done before: *Did you tell a trusted adult?, Call Childline.*
7. Take an action: Chatbot contacted Childline or the Police. *It's chatbot here...*
8. Close the conversation: *Thank you, chatbot.*

Greetings + Introductions	
Primary	
All dialogues included greetings. Greetings + Introduction + Offering (3) Greetings + Introduction + Trust (3) Greetings + Introduction + Advice (2) Greetings + Offering (1) Greetings + Offering (1) – follow up with the chatbot	*Hello, I am your **community chatbot**. What's your problem?* *Hello, I am a chatbot! Do you need any help?* *Hello, I am a chatbot. What do you need help with?* *Hello, I am a chatbot and I am here to help with your problems online, also, I am a robot, not human. Do you trust me?* *Hi, my name is chatbot. Do you trust me or should I explain further?* *Hello! I am a chatbot. I will help you with any online situation. Do you trust me?* *Hi, I am chatbot. If you're worried or upset about anything online come to me. First, before we start, have you told a trusted adult?* (first interaction) *Hi, I am not a human, I am a robot. My first piece of advice: do you have a trusted adult?* *Hello, what do you need today?* *Hi, how may I help you?* (subsequent interaction)
Secondary	
7 out of 13 had greetings. Greetings + Introduction (3) Greetings + Introduction + Offering (2) Greetings + Introduction + Trust (1) Greetings + Offering (1)	*Hi, I am chatbot and I am here to help.* *Hello, I am chatbot.* *Hello, this is chatbot.* *Hello, I am chatbot. Here to help. What's the problem?* *Hi, I am chatbot, how can I help you today?* *Hello, I am a robot. I can help you and you really need it. I can help with anything you need. Do you trust me?* *Hi, how can I help you?*
Remarks	Primary had a more elaborated introduction, always ending the introductory dialogue with a prompt. Secondary had a drier introduction, not always inviting for the dialogue with a prompt. Greetings: are very informal: hi or hello. Introduction: It never received a name, always called "Chatbot". Most of the time is in first person, with one exception only. It states it is not a human and what it works for. One story made a distinction between the first visit to the chatbot and the subsequent one, which was more direct.

Gaining users' trust	
Primary	
The topic trust has been started by the chatbot in 2 out of the 3 dialogues. Greetings + Introduction + Trust (3)	*Do you trust me?* *--* *User: I am getting bad comments on Instagram and I need your help. Are you sure I can trust you?* *Chatbot: of course, I am not even human.* *--* *Do you trust me or should I explain further?*
Secondary	
In 3 out of 6 the dialogues where trust appeared, the topic has been initiated by the user, not by the chatbot. User's request + Trust (3) In one video the chatbot offers to tell the Service Terms, which is a about privacy, to gain users' trust Offering + Trust (2) Greetings + Introduction + Trust (1) Only in one instance the word trust did not appear. Instead, the chatbot uses a strategy to 'make the user comfortable'.	*What's happening? You can trust me! I will help.* *--* *Do you trust me?* *--* *User: I have something to tell you, but I don't know if I can trust you.* *Chatbot: You can trust me. Everything will be kept between you and me, secretly.* *User: Are you sure this is true?* *Chatbot:Would you like me to give you the terms and services of this?* *User:Yes, please* *Chatbot: Everything is hidden and will be kept only between us and won't keep notes unless you allow me to or give permission* *--* *User: I think I need some advice. Do I trust you?* *Chatbot: Yes, of course trust me!* *--* *User: I need someone to trust but I don't feel comfortable telling anyone else.* *Chatbot: That's fine, you can trust me. Don't worry, I won't tell anyone else* *--* *Chatbot: If you feel comfortable in sharing information…*
Remarks	Trust has been associated with privacy or making the user feel comfortable, as seen as a human condition: "*you can't trust me, I am not even human*". Only in one instance the word "trust" did not appear directly. Instead, the chatbot uses a strategy to make the user comfortable. The topic has been sometimes initiated by the user, sometimes by the chatbot. For primary school students, it is part of the introductory dialogue, for secondary usually came after the request or offer for help. The example of a chatbot dialogue presented in the lesson may have influenced more the primary school students on the way to touch the topic. One example suggests the chatbot explaining the Service Terms to gain users' trust.

Approaching the problem	
Primary	
Chatbot offers help (4) Chatbot asks about the situation (2) Chatbot asks about the problem (2) User requests for advice (1) Always with a prompt.	From the chatbot: *How may I help you?* *How can I help you?* *Do you need any help?* *What do you need **today**?* *So, what's happening?* *What happened?* *What's the problem?* *What's your problem?* From the user: *What should I do?*
Secondary	
Chatbot offers help (3) Chatbot asks about the situation (3) Chatbot asks about the problem (1) User starts with a more natural conversation, sharing their feelings, not necessarily with a request for advice (1).	From the chatbot: *How can I help you?* *How can I help you **today**?* *You can tell me anything you want, and I will help you out.* *What's happening?* *What has happened to you?* *What is going on?* *What's the problem?* From the user: *I have something to tell you.* *Hey chatbot, I am not feeling very well.* *I just don't know what to do.* *How do I report a very difficult situation?* *What shall I do?*
Remarks	There is not much distinction in the approach by the chatbot by primary or secondary students. In all cases, it tends to approach with a prompt regarding offering help, asking about the situation specifically. The word 'today' appears twice suggesting they imagine a recurring visit to the chatbot. Primary users typically did not approach the problem but went straight to receiving advice, as the chatbot knew already what the context was. Secondary students used a more natural conversation expressing feelings and anxiety. Typical words from the chatbot were 'help', 'what is happening' referring to the situation or 'problem'. From the user 'what shall I do'.

Describing the problem	
Primary	
User describes the abuse (5) User describes the abuse and asks for help (3)	*People are **bullying** me online.* -- *I have been **cyberbullied** and they **threatened** me with some edited video* -- *Someone is **threatening** me by saying they will write bad comments and contacting my parents and sending me things I shouldn't have. Anyhow…* --

User describes the abuse and report the action already taken (2) – revisit to the chatbot	*I was chatting online with this person and he asked me if I like cats, I say yes, and he got a little more bossy and **asked me to send pictures** of me in my pyjamas. Then he started **threatening** me and I was ignoring him* -- *I was online on Facebook and a random stranger started texting me. At first it was ok, but then suddenly he started **asking for pictures of my** PJs. I felt uncomfortable, I told him no but then he **threatened** me he will tell my parents I've been doing bad things online and he will say bad comments about me.* -- *I've been **cyberbullied** on TikTok. What should I do?* *I am getting **bad comments** on Instagram and I need your help.* *I've been **bullied online** and I am not really sure what to do* *The people from our school they have been **calling me xx**, **making fun of me** for the videos I've done.* -- *We have told the trusted adult and she said she can't do anything to help us.* -- *User: Hello chatbot, I am back, this time with my dad. My dad is wondering if I should go to the CEOP website.* *Chatbot: Definitely, there's no harm whatsoever. They will answer all the questions*
Secondary	
User describes the abuse (5) In 3 of the 5 examples, the chatbot engages in a conversation obtaining more details of the abuse. User describes the abuse and asks for help (2)	*My girlfriend sent me a **nude picture** and now is pressuring me to **send one back*** - *I am being **bullied by a group of people online** but I don't want to get them in trouble, I just want an advice* -- *User: I've spoken to someone online and now he's **blackmailing** me.* *Chatbot: Do you know them personally?* *User: Not personally, but they know me very well and that scares me* *Chatbot: How did they know you well? What did you send?* *User: All my personal things* *Chatbot: Do you have any close friends that could have uploaded it?* *User: My boyfriend* -- *User: This boy on Instagram is making **me feel horrible about myself*** *Chatbot: Well, that doesn't sound nice... What is he saying?* *User: That my family hates me and should not be heard* -- *User: I've been talking to someone for a while and few minutes ago they **asked for certain photos*** *Chatbot: If you feel comfortable in sharing information, what photo have you been asked for?* *User: They asked for my top half of my body without any clothes*

		--
		He's **blackmailing me**. What shall I do?
		--
		I've been **blackmailed** on YouTube video, what shall I do?
		He **threatened** that he would share a video of me
Remarks	Some of the descriptions reveal the platform and the prosecutor. Likely, the chatbot does not need details of the stories to provide adequate advice. However, giving the opportunity to the user to speak it out may be a supportive attitude. That is a strategy to be further investigated. Beyond reporting and receiving advice, users seem to want to express how they feel. These examples also illustrate the user coming back to chatbot and responding to the first advice received.	

Chatbot providing advice or action		
Primary		
	Imperative instructions (4)	*First, before we start, have you told a trusted adult?*
		--
		Block them first and click the CEOP report button we will report to the Police.
	Interrogative instructions (3), some suggesting next steps, some asking what they have already done	--
		First, block the bullier. Then, tell a trusted adult.
		--
		My first piece of advice: do you have a trusted adult?
		--
		Did you tell any trusted adult?
	Suggestive instructions 'should' or 'why don't you' (2)	--
		First thing to do is to block this user. Telling an adult? Have you already?
		--
		Ok, because of this you should go and tell a trusted adult or go to childline
		--
		Here are some good info. Why don't you talk to your parents?
		You should tell then. I also suggest to call the police, the CEOP button
Secondary		
	Imperative instructions (3)	*Go to CEOP or your parents*
		--
		Ok, do you have a trusted adult you can tell?
		--
		Have you talked to a trusted adult? Is your account private?
	Interrogative instructions (3), some suggesting next steps, some asking what they have already done	--
		Have you contacted CEOP? If you haven't, click on this link
		--
		You have been very brave sharing this information with me! My advice will be that you should not send any photo and tell a trusted adult
	Suggestive instructions 'should' or 'why don't you' (4). Multiple interactions.	*User: I've blocked the harasser. Is there anything else you can tell me?*
		Indeed, If you still don't feel comfortable to talk to a trusted adult, you can always sort the indulge at Childline via website of by phone 0800111

	Two dialogues ask for more details of the situation. These dialogues show more psychological support and empathy. One story illustrates how they expected the chatbot to act showing it calling Childline directly.	-- *Well, that doesn't sound nice... What is he saying? oh well... Have you told anyone? Well, I think you should tell them (ask more about the situation)* -- *I can help you with that. If you don't feel comfortable doing as I have advised tell me and there are other things to do* -- -- *Do you know them in real life? How did they know you well? What did you send? (...ask details about the situation)* *Go to the CEOP and ask them for help* *Or go to IWF that's can take the photos down* -- *Chatbot: it sounds serious! I think you should report them using Childline if you feel comfortable* *User: What do I say to them?* *Chatbot: Just explain to them what you have explained to me and all will be sorted* -- *Ask your parents for advice and see what they have to say about this. You should keep nothing from them and they have the best help* -- *Chatbot: Ok, I need to contact the Childline, please give me a moment* *Childline: Hello, how can I help you?* *Chatbot: Hello, this is chatbot. We have a situation* *Childline: What is the situation?* *Chatbot: There's a 13 y/o girl talking to a 32 y/o man and he knows everything about her, he's threatening her to come to her house and expose her if she doesn't send more pictures* *Childline: All I can do about this is to phone the police.*
Remarks	Dialogues from primary school students are more imperative, giving direct instructions, while the older students aimed for some psychological support and demonstrations of empathy. The chatbot could mix strategies using questions, suggestions and imperative instructions to emphasize urgent actions. And give some opportunity for the user to tell more about what happened if they feel good about that. This content can be used only to measure the level of severity or urgency of the abuse and contact a person when necessary. One example shows the chatbot calling Childline itself. Although this will not be the case, the chatbot can indeed instruct the user to shape a report.	

Closing the conversation	
Primary	
Most of the stories ended with an action by the Police, not back to the chatbot. In only 2 stories the user came back to the chatbot to thank.	*User: thanks for helping out chatbot* *Chatbot: no problem* *--* *This has made the situation really good. And thank you to you chatbot.*
Secondary	
One story illustrated the user reporting the action taken before thanking the chatbot. The other two stories that ended with the chatbot, the users were casual and in one case the chatbot showed emotion 'glad I could help'.	*User: Ok thank you, you helped me a lot. I told my trusted adult and them helped me as well. Goodbye* *Chatbot: Glad I could help. If you need me again I am always available 24/7, have a good day.* *--* *Ok, thank you, bye chatbot* *--* *Thank you for your advice* *Have a nice day*
Remarks	Before finishing the interaction, the user may want to report the action taken or outcome. The chatbot demonstrated satisfaction in helping in one of the stories.

4.3   Chatbot Requirements

The requirements for a chatbot were collected as groups' responses to the questions in the form illustrated in Fig 3: when the chatbot would be helpful, when it will not be helpful, what would make you use it, what would put you off, why it is a good idea to have a chatbot and their expectations.

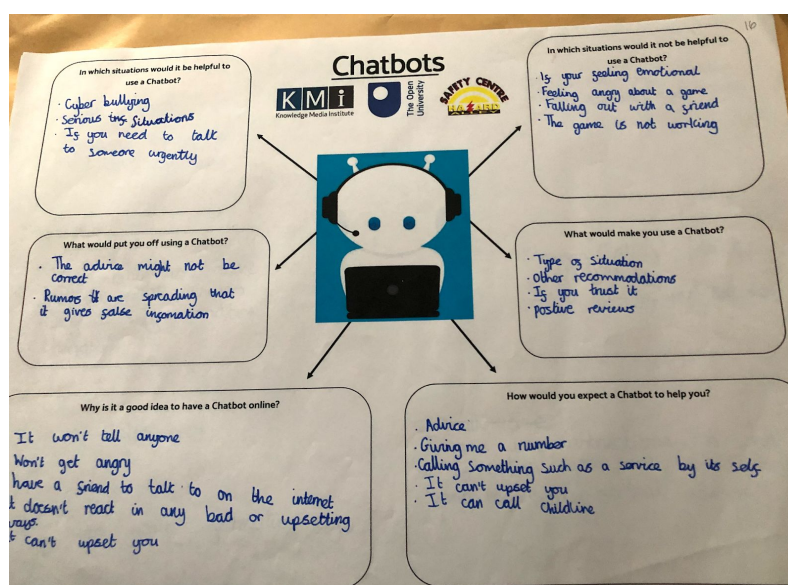Fig 14 - Example of filled form with groups' response

As an overview of the further analysis, Fig 15 presents the 20 most frequent words found on the responses, suggesting that:

-   Cyberbullying was the most popular type of abuse considered;
-   Providing advices was the most expected feature;
-   Potential users expect to express their feelings;
-   The chatbot has been seen as 'someone' available to talk to;

- The involvement (or lack of) of a trusted adult is an important aspect when deciding on whether to use a chatbot or not.
- Developing trust towards the chatbot was considered an important aspect for its appropriation.

Fig 15 - Word cloud with participants' responses to chatbot requirements

The responses were then qualitatively grouped by similarity initially following the original questions in the form. As the requirements extracted from the responses are across these questions, they were further sorted by:

- **What** the chatbot should do, including **what it should NOT do** and main concerns
- **When** it should be used and **when it should NOT** be used
- **Why** using it
- **How** it should work

Although the results are reported ordered by occurrences, many innovative ideas have been uniquely proposed. Therefore, the most frequent responses reflect the most common perceptions and expectations, but other unique suggestions should be considered as requirements too. Users' concerns are also reported as they can lead to relevant requirements.

4.3.1 What the chatbot should (and should not) do

A. Functional requirements	B. Users' concerns
- Providing advice (45) - Provide useful links (11) + information (3) + phone numbers (8) - Call/provide someone when needed (7) - Offer the robot or person (3) - Not store any personal data (3) - Taking the right measure/redirect to the right place (3) - Assess how serious (3) - Contact Police (3) + Childline (2) - Report perpetrator (2) - Track perpetrator - Contact perpetrator (1) - Do not refer to strangers	- Stores your information to learn about you (AI) (3) - Getting a wrong advice (2) - Triggers a report without authorisation - Tell the perpetrator

4.3.2 When it should (or should not) be used

A. Types of abuse

- Cyberbullied (49)
- Threatened / Blackmailed (12)
- Being asked for personal info (6)
- Being asked (or sent) pictures (sexting) (6)
- Grooming (6)
- Online abuse (5)
- Dealing with someone rude or mean (4)
- The abuse is not too serious or life-threatening (4)
- Serious situation (4)
- Toxic household/domestic abuse (2)
- Harassment (2)
- When worried about a friend (2)
- Child exploitation
- Trolling
- Rape
- Stalked
- Being catfished

B. Personal circumstances

- Feel unsafe/uncomfortable (22)
- Feeling not good/worried/ uncomfortable/sad (19)
- Need someone urgently but don't have anyone or don't trust anyone (18)
- Embarrassed to tell a human / (13)
- Feeling upset / annoyed / angry (12)
- Don't want a parent or another adult (9)
- Don't know what to do / need help / in trouble / unsure (6)
- Depression (4)
- Suicidal thoughts or self-harm (4)
- Parents cannot help
- Drugs addiction
- Feeling lonely
- Undesired pregnancy
- Bullying in physical life
- Want to talk about feelings

C. When it should NOT be used

- When you don't trust / don't know much about it / who is behind it (10)
- It's just a play (not serious enough) (10)
- Offline abuse or threat (9)
- Too serious issue (8)
- Prefer a human instead (7)
- In-game related issue (5)
- Can sort it yourself (5)
- Physically injured (4)

- Was recommended to not use it (3)
- Blackmailed (3)
- Victim is too emotional (3)
- Friends related issue (3)
- Need instant action (2)
- Need emotions back (2)
- Feeling too angry/moody (2)
- Do not know how to write/read English

4.3.3 Why using it

A. Chatbot expected behaviour

- No judgment (10)
- No reactions (7)
- Keep it private (7)
- Comforting you (6)
- Don't upset you (4)
- Gives better advice than humans (3)
- Better than parents (3)
- It's not human (2)
- Understand your emotions (2)
- Motivates you to report (2)
- Ask less questions than a human
- Respond like a human
- Act like a friend
- More than a person to turn to

B. Satisfy user's psychological needs

- Comfort users (8)
- Helps users to understand their problem (5)
- Having someone always available to talk (4)
- Help users (3)
- Make users feeling safe (3)
- No embarrassment (3)
- Can tell things straight away (3)
- Help to talk to adults after (3)
- Boost users' confidence (1)
- Opportunity to talk about feelings (1)
- Make you feel safe (2)
- You're not open enough to talk (2)
- Clear your mind
- No guilty
- Help you to understand

	- Someone to talk when you don't want to talk
C. As a service - Trust it as a reliable technology (privacy) (4) - Easy to reach (access) (4) - It's free (3) - Recommended by a friend (3) - Always available (2) - Easy to use (2)	- Versatile (deals with many situations) - Many people can use it - There will be less bad people around - Adults recommend it - It's not the Police - Knowledgeable: has experienced similar things before

4.3.4 How it should (or NOT) be

A. Emotional characteristics - Nicely/Kindly (6) - Encouraging (2) - Show sympathy - Relieving - Listening - Understanding - Not Judging - Not laughing - Helping - Comforting - Reassuring - Raising confidence - Humanised - Respectful - Friendly - Don't get angry	**B. Technical characteristics** - Safe / encrypted (6) - Do NOT ask for personal information (4) - Don't waste storage
C. User Interface / Dialogue - Ask the user what's wrong - Refer to a responsible adult - Give ideas - Answer to questions - Evidence it worked before - Don't offer two options only - Looks nice - Don't pretend being a robot - Give examples	- Don't say 'it was funny' - Don't say 'I am not even human' - Don't say random things - Don't use probing questions - Don't ask 'Do you trust me?" - Don't ask too many questions

5   Socio-technical requirements for the information system

The data collected through the surveys, dialogues and requirements are then analysed grounded on the Socially-Aware Design (Baranauskas 2014) and the Organisational Semiotics (Stamper, 1973,

1993), approaches to information system design that guide transforming stakeholders' views into socio-technical requirements.
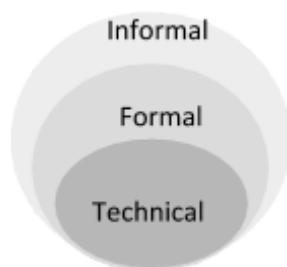

Fig 16 - Three layers of an information system

Within this approach, design is seen as a three-layer process (Fig. 16) considering first the informal aspects of a society (e.g. people's values, beliefs), then the formal aspects (regulations, rules, procedures), towards the construction of a technical system. The technical layer, on the other hand, impacts back on the external layers towards influencing the society. This understanding suggests that innovation risks failure if only the technical level is considered and is not compatible with people's beliefs, or current practices or regulations (Baranauskas et al 2005).

The Semiotic Ladder (Stamper 1973; Liu 2000) is an artefact used within these approaches that considers the information system as a communication process with several layers of meaning. As described in the Table below, the previous results analysed from each of these layers' perspective led to a set of socio-technical requirements:

Semiotic Ladder layer	Chatbot socio-technical requirement
Social World deals with the social consequences - beliefs, expectations, culture, etc.	The chatbot **should pursue that the user will end the conversation ready to take the appropriate action**, be it just a protective measure like changing privacy settings, talk to a Childline counsellor, or even report someone to CEOP/Police if the issue justifies this measure. Any further action should be taken by the initiative or of the user, with or without the support of a trusted adult. **The actions can be facilitated (redirected) by the chatbot,** as providing a link to contact a stakeholder or call a counsellor.
Pragmatics deals with intentions, conversations, negotiations, etc	The chatbot should **approach the users' intention straight away** in the case the user did not have this initiative when starting the conversation. Also, it has to quickly **assess whether the request is within its scope** or not, to avoid disappointment and frustration. The chatbot should target : - **Gain users' trust** in the initial steps of the conversation; - Make sure the **user is comfortable** during the conversation; - Make sure the user is **feeling good emotionally** when the conversation finishes. Users' intents: - **Assess the severity** of the online abuse they are suffering; - **Get information on possible measures to protect themselves** (changing privacy settings, block the person, involve a trusted adult, etc.);

	- **Get advised whether they should be directed to Childline or CEOP** via phone or be redirect from the bot to call them straight away; - Get advice on **what information they need to make a report** and the eventual consequences of reporting it. - **Feel more confident** about the issue; - **Feel better emotionally**.
Semantic deals with meaning, propositions, truth, denotations, etc	To define the meanings in the conversation, the chatbot should initially inform **how it operates, what sort of data could be stored, what institutions are behind it**, **the eventual availability of a person in case of urgency**.
Syntactics deals with format structure, language, records, etc.	The chatbot should communicate in **first person**, in **casual English, with contractions**, using **plain language** suitable to children from 11 years old. It should distinguish if that is the **first or subsequent contact** by the same user. **The grammar should be adjusted** to suit younger users (typically primary schools) from the older ones. According to the terms used by the user to describe the abuse, the chatbot can level the vocabulary towards a more or less naive language (e.g. referring to 'worrying situation' instead of 'abuse'), and use of more imperative forms to advise younger users.
Empirics deals with patterns, codes, redundancy, channel capacity, etc.	**Private information (name, address, etc) should not be stored** by the chatbot. The conversation should be encrypted and the user should be informed by that. **The only record maintained is whether it is a recurrent user or not**.
Physics deals with the physical aspects of signs like hardware, etc.	The chatbot should be available while the user is playing games or accessing diverse social media. Therefore, **cross-platform messaging and Voice over IP (VoIP) platforms** like WhatsApp or similar could fit the criteria for **ubiquitousness** and **encryption**. Having a **phone number associated** is also in line with the current approach to promote Childline to schoolchildren. Mobile devices also seem to be adequate to not expose the users to people in the surroundings while interacting with the chatbot. It can also easily redirect the call to the Police/CEOP in case of emergency. **Childine/CEOP websites should also host it** for being considered the typical place where users would look for it initially.

5.1 Chatbot design

The three central elements that compose the main design of chatbot are the **conversation flow, intents** and **entities**, which are extracted from the users' utterances by most of the Natural Language Understanding platforms. An intent represents the purpose of a user's input, each request. And an entity represents a term or object that is relevant to the intents, providing a specific context.

The conversation flow described in Fig 17 below is a generalisation taking into account the dialogues extracted from the co-creation activity. The actual implementation of the chatbot should detail this process including errors handling, feedback to the users, as well as tailoring it to the institution

offering the chatbot as a service, be Childline, the Police, or any other. Similarly, the intents and entities described below should be considered as a preliminary input to develop the chatbot.
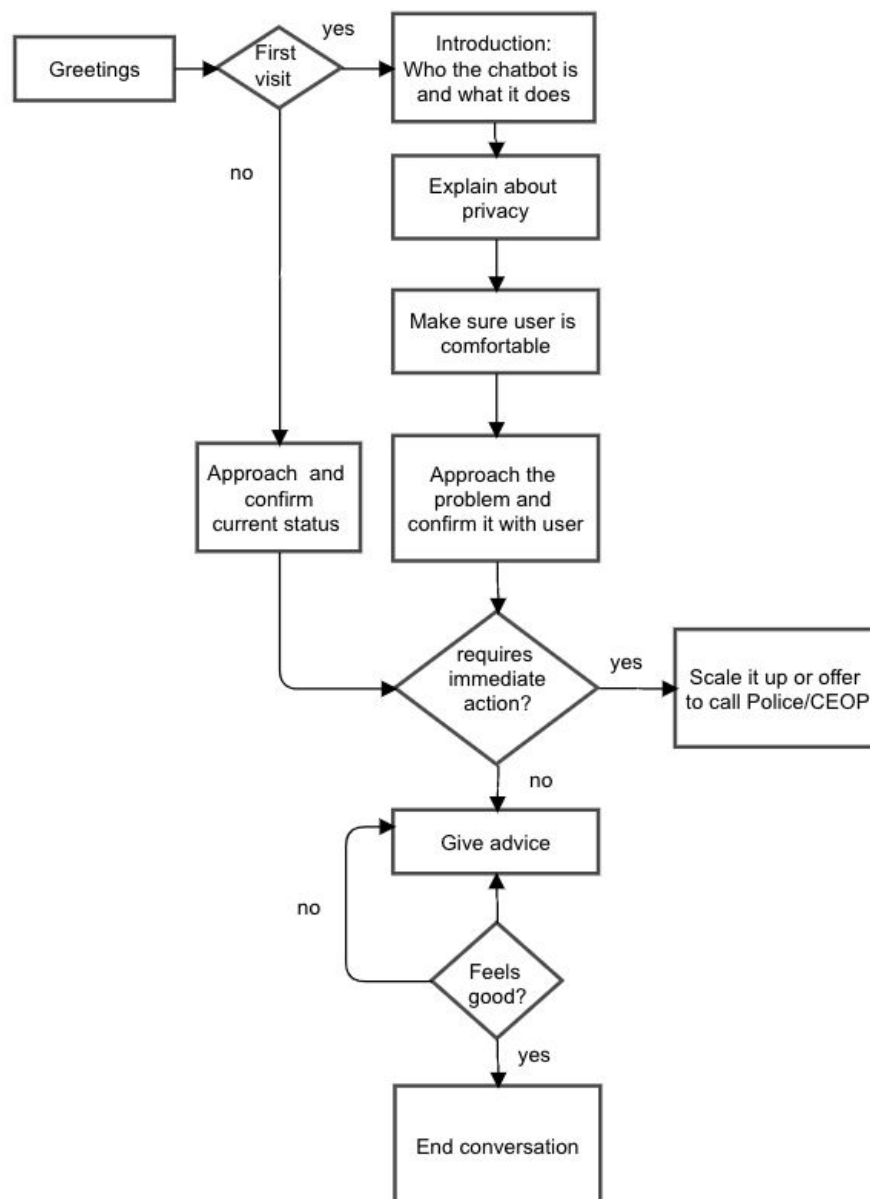

Fig 17 - General conversation flow

Intent	Some potential entities
Assess the severity	type_of_abuse, victim, platform, perpetrator, object_of_blackmailing, relationship_with_perpetrator
Protection advice	platform, trusted_adult
Reporting advice	type_of_abuse, victim, platform, perpetrator, object_of_blackmailing, relationship_with_perpetrator
Feel more confident	indicated_trust, first_visit

Feel better	initial_emotional_state, final_emotional_state

6   Final remarks

Although the NSPCC survey (Bentley at al 2019) states that 78% of parents/carers agree with the statement "I feel I know enough to help my child stay safe online", this study revealed that especially the younger potential users perceived the chatbot as filling a gap when they feel they cannot rely on the parents to help with an online issue. It should be used mainly when they are unsure about the situation and need knowledgeable advice that helps them to assess it. Thus, it could be an entry point to a counselling channel, preparing the user in emotional and practical aspects to formally request for help or report a crime.

As a co-creation method, the storytelling strategy supported by sketches with Lego figures was considered adequate to engage the students, collect their perceptions and expectations of a chatbot, as well as the typical elements they would consider as part of the dialogue. The method was suitable for both primary school students and secondary, revealing differences in the way they refer to the issue of online abuse, strategies to sort it out, and emotions involved. The elder clearly expressed they would expect to receive some psychological support from a chatbot.

As the survey results evidence, most of the students participants have never seen or interacted with a chatbot before, so a short example had to be introduced for them to make sense of the possibilities. Mentioning 'trust', this example might have biased the participants' towards being specifically concerned about this aspect. Nevertheless, what are the elements that may lead them to trust the technology, e.g. privacy or not reporting or contacting the perpetrator without consent, to name a few, could be identified.

The results should guide the initial design of a chatbot suggesting strong socio-technical elements that to be considered according to pupils' perception. However, the implementation per se relies on some technical particularities of the chosen platform, for example, on the decision for using or not Artificial Intelligence to learn from previous dialogues, and the business model of the provider, therefore it has to be further specified and detailed to this end. Handling errors in the natural language understanding process, a crucial aspect for a successful chatbot, has not yet been considered in this preliminary design either.

Chatbots have been successfully applied commercially for dealing with mental health issues, capturing emotions and leading to desired emotional states (e.g. Woebot[3], which is grounded on behavioral science research). Lessons learned from these platforms can lead to important advances on a chatbot for tackling online abuse and many design strategies should be further investigated in the context of online safety. For example, the impact of using memes and images in the chat, whether they could be beneficial or not to users under stressful situations.

---

[3] https://woebot.io/

References

Baranauskas, C. Social awareness in HCI. ACM Interactions, 21, 4 (Jul'14), 66-69 (2014)

Baranauskas, C. et al. Guiding the process of requirements elicitation with a semiotic approach. 11th Intl. Conf. on Human-Computer Interaction; Las Vegas, 100-110 (2005)

Bentley, H. et al (2019) How safe are our children? 2019. An overview of data on child abuse online. https://learning.nspcc.org.uk/media/1747/how-safe-are-our-children-2019.pdf

Brandtzæg, P.B., Følstad, A.: Chatbots: Changing user needs and motivations. Interactions 25(5), 38–43 (Aug 2018). https://doi.org/10.1145/3236669

Følstad, A., Brandtzæg, P.B.: Chatbots and the new world of HCI. interactions 24(4), 38–42 (Jun 2017). https://doi.org/10.1145/3085558

Følstad, A., et al.: Sig: Chatbots for social good. In: Extended Abstracts of the CHI 2018. ACM, New York, USA (2018). https://doi.org/10.1145/3170427.3185372

NSPCC (2019) Protecting children from online abuse. https://learning.nspcc.org.uk/child-abuse-and-neglect/online-abuse.

Hamilton-Giachritsis, C., et al (2017) Everyone deserves to be happy and safe: a mixed methods study exploring how online and offline child sexual abuse impact young people and how professionals respond to it. London: NSPCC.

Jain, M., et al.: Convey: Exploring the use of a context view for chatbots. In: Proceedings of CHI 2018. pp. 468:1–468:6. ACM, New York, USA (2018)

Liu, K. Semiotics in Inf. Systems Engineering. Cambridge Univ. Press, Cambridge (2000)

Michael McTear. 2018. Conversational Modelling for Chatbots: Current Approaches and Future Directions. In Studientexte zur Sprachkommunikation: Elektronische Sprachsignalverarbeitung 2018, Andrá Berton, Udo Haiber, and Wolfgang Minker (Eds.). TUDpress, Dresden, 175–185.

Oracle Corp.: Can virtual experiences replace reality? the future role for humans in delivering customer experience (2018)

Piccolo, Lara; Mensio, Martino and Alani, Harith (2019). Chasing the Chatbots: Directions for Interaction and Design Research. In: Internet Science. INSCI 2018 (Bodrunova, s ed.), Lecture Notes in Computer Science, Springer, pp. 157–169.

Piccolo, L.S.G., Roberts, S., Iosif, A., Alani, H.: Designing chatbots for crises: A case study contrasting potential and reality. In: Proceedings of the British HCI Conference. p. (Early Access). ACM (2018), http://oro.open.ac.uk/55325/

Rogers, E.: Diffusion of Innovations. Simon and Schuster, 5th edition edn.

Sanders, A. (2018), "Generative tools enhance creative and ethical research with children", Qualitative Research Journal, Vol. 18 No. 1, pp. 33-44. https://doi-org.libezproxy.open.ac.uk/10.1108/QRJ-D-17-00019

Sanders, E.B.-N. and William, C.T. (2002), "Harnessing people's creativity: ideation and expression through visual communication", in Langford, J. and McDonagh, D. (Eds), Focus Groups: Supporting Effective Product Development, Taylor and Francis, New York, NY, pp. 145-156.

Stamper, R. Organisational semiotics: Informatics without the computer? Information, organ. and technology: Studies in organisational semiotics. Academic Press, NY (2001)

Stamper, R. Information in Business and Administrative Systems. Wiley, NY (1973)