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The use of informative and decorative pictures in Health and Safety posters for children

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

This thesis has been proofread by a professional proofreader and its content has not been modified.

Sara Copetti Klohn

The content of Chapter 6 has been published as 'Klohn, S. C. and Black, A. 2018. "Informative and decorative pictures in health and safety posters for children." *Visible Language,* 52(3): 31-50. ISSN 0022-2224'. The content presented in this thesis remains fully the independent research of the candidate.

To my dad.

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Abstract

This thesis investigates printed health and safety (H&S) information for children, focusing on pictures typically presented in posters and their relationship to the poster message. It examines the impact of different approaches to pictures on children aged 7 to 11. A sample of H&S information for children was analysed with a framework developed in this research. The analysis revealed that pictures tend to play either a decorative or an informative role, respectively independent of or supporting the message given in a poster's text.

The impact of the different types of picture was further investigated in two studies that aimed to identify children's responses to them across two age groups: 7–8 year olds and 10–11 year olds. These age groups were chosen because the materials in the sample were targeted at 6–12 year olds, despite children's developmental and cognitive differences across these years. Five posters were designed and tested. The verbal information was held constant in the posters but the pictorial information varied: two variants had informative pictures, two had decorative pictures, and one had no picture. The results suggested that children's responses to the different kinds of picture differed according to their age. In the first study younger children benefitted more from the decorative picture than older children, who benefitted more from the informative picture. In the second study this polarisation was less evident. Overall, three concluding remarks were drawn from the studies: (1) Posters with informative picture communicate slightly better for older than younger children; (2) an emotional response to pictures benefits younger children more than older children; and finally, (3) tthe detail of picture–message relationship should be considered when designing posters for children.

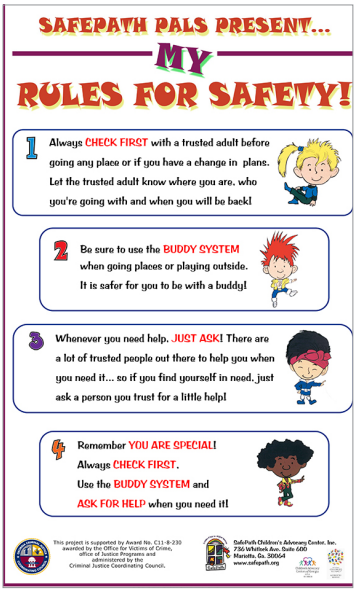
This thesis suggests that conducting research with lower and higher age segments might be beneficial for designing appropriate H&S information for children. A classification of pictures for artefacts such as posters for children is proposed. Finally, the limitations and contributions of the thesis are discussed, and suggestions are made for further research in this area to expand our understanding of how to maximise the impact of H&S posters for children.

Contents

List of figures

This thesis examines current Health and Safety (H&S) information for children, investigating specific aspects to determine whether the materials are designed appropriately for children within the age range that is typically targeted. To do this, I focus on the pictorial elements of printed materials such as posters, fliers, and other materials, and I test posters with designs that have been based on typical features of current examples of H&S information for children. Considering that there are no standard rules for designing such artefacts, this research relies on an analysis of a sample of these materials. See, for example, the three posters in Figure 1 that have different ways of communicating the topic (i.e. child abuse). The poster on the left (a) might be described as simpler than the others because it is structured in the form of a list, although it uses the same features as the poster (b) in the middle: drawings depicting children that link with text. The posters in the middle (b) and on the right (c) seem to have been through a more extensive design process than the first poster and have very different visual strategies, the first focusing on the depiction of children and the second focusing on objects. These posters exemplify a fraction of the great variety of existing H&S information.

a



b

c

Figure 1: Three design examples of H&S information for children by different organisations about the same topic: (a) child abuse poster, size 25 x 42 cm, targeting children (no specific age range identified) (source: Safe Path – Children's Advocacy Center, USA, retrieved in 2017); (b) elaborated design in child abuse poster, size A3, targeting children (no specific age range identified) (source: Educate 2 Empower Publishing, Australia, retrieved in 2017); (c) poster about child abuse prevention, size A4, targeting 5- to 9-year-olds (source: NSPCC, UK, 2015).

The area of how best to design such H&S materials for children lacks research. Due to the variety of layouts and design processes, and the scarce research in this area, this thesis aims to identify the most common features of current H&S information for children and to verify whether selected features are appropriate to the wide age group targeted by the materials. The thesis aims to deliver an understanding of children's perceptions of the materials they see and to provide insights that may be useful to people developing H&S information for children: these are likely to be commissioned designers or schools and organisations acting without the participation of

a designer (the latter may be an efficient practice considering financial limitations and the evident knowledge about children and their needs that teachers and professionals who work with children have).

In order to achieve the objectives of the thesis and to move towards developing more research in this area, a sample of H&S information was collected and was analysed by using a framework developed especially for this purpose. Pertinent theories from related fields formed a theoretical basis that could be used to analyse the sample. Focusing on the pictorial information that is prevalent in H&S information for children, studies about the use of pictures in other circumstances are discussed, such as their use in storybooks and textbooks, about cognitive theories of learning that include words and pictures, and about children's cognitive development. This thesis is divided into nine chapters, as follows.

1.1 thesis structure

The context and aims of this thesis are presented in this introductory chapter. The following chapters then consider the relevant literature, the sample of existing H&S information, and practical investigation with children.

Chapter 2 presents general aspects of current printed H&S information for children, introducing the sample of examples collected for this research, through which the age group targeted in this thesis was defined. A literature review discusses the functions and impact of pictures in other artefacts, narrowing the existing theories to make parallels between these different artefacts and H&S information for children.

Continuing to discuss relevant theories, **Chapter 3** associates them with characteristics of the sample, developing a framework to analyse H&S information for children. Emerging from the characteristics of the sample's artefacts, and aiming to analyse the sample, this framework uses a combination of descriptive and content analysis methods. Three levels of analysis constituted the framework, and each category in each level is discussed separately and is exemplified with items from the sample.

Chapter 4 presents and discusses the analysis of the H&S information using the framework. This analysis permitted identification of common features of this specific sample, but also demonstrated that, although a few features were constant, others were split into two or more groups with different characteristics. These findings led to the selection of features that were further investigated and tested with children.

Cognitive and developmental theories are discussed in **Chapter 5** in relation to some of the typical features found in the analysis described in Chapter 4. Cognitive theories about learning through pictorial and verbal information and the role of motivation in learning are key aspects of this chapter. Given the wide age range found to be usually targeted by H&S materials, children's cognitive development is discussed with respect to the two ends of the wider age group range (7 to 8 and 10 to 11 years old) and the differences in cognition between these two age

groups, which might influence the comprehension of H&S materials. This difference formed the basis of the experimental studies that were carried out, which will be discussed in the following chapters.

The first study conducted with children in this research is discussed in **Chapter 6**. This study tested three poster variants with different pictorial information and was conducted in one school with children from two school years and therefore two age groups. The materials and methods are described and the results for each school year are initially discussed separately and later compared, using thematic analysis to identify tendencies in children's responses to the posters. From these tendencies, some working conclusions are drawn, leading to further investigation in a follow-up study.

Chapter 7 presents and discusses the second study, which was conducted in two schools and had children from two school years in each. The methods and materials were developed from the first study, with the inclusion of two new poster variants. Due to the high number of participants and variables in this study, the analysis of the data was conducted differently from in the first study; the KJ method (Scupin 1997) was used for this purpose and is described in this chapter. The findings for each school are discussed separately and then in combination. The findings from this study showed weaker patterns than those from the first study.

Chapter 8 compares the outcomes of both studies. Discussing commonalities of and differences between the studies, this chapter identifies possible reasons for such results and starts delineating some insights for this field of research.

Bringing together the two studies and the previous chapters, **Chapter 9** combines theory and practice to discuss the general results of this thesis, taking into account the examples collected and analysed. A new classification of pictures used for materials such as H&S information is proposed based on children's responses to the pictures tested. General methodological issues are examined. To conclude, the limitations of this thesis and views on future research are discussed.

1.2 thesis scope and limitations

As mentioned above, this thesis looks at printed H&S information, being mostly posters, that target children from 6 to 12 years of age. Although posters are only one type of resource that teach children about H&S, and other media such as TV and websites are also used, these are not included in this research, mainly because children have a different interaction with dynamic and interactive materials than with printed materials. To start with, when talking with schoolteachers during this research, I identified that H&S information is often delivered in school lessons in which children interact with the materials, and this is similar to how I used them in my studies. The posters were sized A4, which allowed children to easily handle them. Children might, however, encounter posters without intervention, displayed on their school walls or in other locations, but this sort of interaction was not included in the studies. Moreover, this thesis investigated artefacts composed of

pictures and texts in which the pictures are very important and the verbal information is limited, although also significant.

Children's responses to these artefacts were evaluated during group conversations, a method known to provide rich discussions, but they do not allow the capture of individual children's responses. This is a limitation of the studies, because some participants might exert influence over others (which was noticed in the first study), therefore affecting the results. This is discussed in more detail in Chapters 6 to 9.

With respect to the age range, the analysis of a sample of current H&S information collected from different countries demonstrated that this information usually targets children between 6 and 12 years of age. Although this might not seem a wide age range – comprising only six years of a child's life – children's cognitive development changes significantly in this period of time. However, due to schools' organisation, the investigation had to happen with children from Years 3 and 6, meaning that the two age groups were 7–8 and 10–11. Perhaps including 6- and 12-year-olds in the study would have changed the outcomes of the study. Nonetheless, it is likely that the tendencies identified would have been more visible rather than different.

Chapter 2 | General aspects of health and safety (H&S) information for children

This chapter discusses aspects of H&S information for children, providing an introduction to the thesis topic. The aspects considered here are the types of materials that composed the sample studied and the pictorial and verbal components of these materials. These are related to existing, relevant research. By discussing the sample gathered for this research, I delimit the study and present some issues encountered when studying these artefacts for children (e.g. existing materials intended for print that could only be accessed online).

The broad overview of this chapter defines the age-group focus of the research; this emerged from the corpus, in which a tendency in H&S information to target an age bracket of children between 6 and 12 years of age was uncovered. This targeted age range is fundamental to the research because it spans developmental differences in children's cognition that seem to be somewhat neglected in the design of H&S information for children.

What also emerged from the overview presented in this chapter was the need to develop a framework to analyse the sample collected and determine some typical features of H&S information for children. This analysis is presented in the next chapter. Prior to the analysis, the pictorial and verbal information in samples from the corpus were considered. Both types of information are important for effective message communication, but the primary interest of this research is pictorial information. Hence, this chapter discusses the function of pictures: how they attract attention, might produce an affective response in children, and have a cognitive function. It also considers how pictures could act as disruptive elements. Primarily, however, pictures need to be understood by children for effective message communication. Verbal information receives less focus here but its influence and the interplay between verbal and pictorial information is acknowledged here and throughout the thesis. This chapter considers some aspects of verbal information where it relates to communication in combination with pictures.

Note that due to the lack of existing research on the specific topic of this thesis, parallels are drawn between H&S information for children and storybooks and textbooks in the discussion of the literature at the end of this chapter. Where possible, relevant research findings in these areas are applied to the present study.

Terminology

Most researchers refer to relationships between *text* and *picture* (Norman 2010; Kong 2006; Kress and Leeuwen 2006). In doing so, they are usually considering the meaning of the contents of the texts and the pictures. In this research, I also, however, look at the meaning of the *visual* characteristics of both texts and pictures, which makes the term 'text' inappropriate since it does not suggest the two aspects of it. Thus, I use the term *verbal* to refer to all aspects of the written text and the term *pictorial* or *picture* to refer to a picture; this choice of terms is

based on Twyman's (1985) classification of types of language. Twyman considers that 'graphic language' can be verbal, pictorial, or schematic and places verbal and pictorial at the same level of importance. Using his model, one can consider not only the meaning of the words but also their visual meaning. Twyman also differentiates 'visual graphic verbal' language from 'aural verbal'. Although I agree with his classification, I simplify it by using the word 'verbal' to refer to the former type of language for conciseness. As for the pictorial elements, the word picture is used as a synonym (for more on Twyman's classifications see page 19 in section 3.3). Occasionally, the term word is also used to refer to verbal information.

2.1 Available resources of H&S information for children

This research was based on a sample of 64 examples of H&S information collected for the study. Although the internet is, increasingly, a source of information for adults and children alike, discussions with laypeople and schoolteachers made it evident that printed resources are still frequently used to disseminate H&S information to children. Governmental (e.g. UK Department for Transport, DfT) and non-governmental organisations (e.g. Royal Society for the Prevention of Accidents, ROSPA) use printed resources alongside websites for H&S education. According to a DfT report, posters of its road safety campaign were the second most common media seen by children in 2009 – the first most common media was TV (ChildWise 2009). Although in 2011 spontaneous awareness of the posters dropped (ChildWise 2011), they are still produced in large numbers nowadays. The described drop in awareness could be explained by the reports' nature, which focused mainly on the medias of TV and cinema adverts. The persistent use of printed resources could relate to Marks et al.'s (2006) finding that print media elicits greater attention and message processing than web media. Although this study could be outdated because digital media has been increasingly used in schools since its publication, at that time their hypothesis was that school-aged children might perceive print as didactic and web resources as entertainment. Other rather old studies have shown primary children have difficulty in making an efficient search on the web, only access the first results of a search, do not evaluate properly the reliability of many websites, and often do not know the appropriateness of the information retrieved (Hirsh 1999; Large and Beheshti 2000; Bowler et al. 2004; Nesset 2007). More recent studies were not found to support or refute such ideas, and the reasons why printed artefacts are still frequently used may not yet be documented. Nonetheless, organisations (such as those cited earlier) usually maintain, alongside specific websites for children, online sections where the printed information is available to schools or parents on request.

Population targeted

This thesis looks at information targeting children but not parents or carers. When gathering the sample for the analysis, there were materials that at first glance seemed to be aimed at children due to their visual aspects but, on a closer look, they were identified as

targeting adults. In such cases, the appearance was used to visually demonstrate that the message being sent to parents and carers concerned their children. This sort of material was not taken into account in this research since children were not the primary targets of it. Two posters below exemplify such artefacts. On the left (Figure 2a), the poster from Diabetes UK advises parents about signs that could indicate type 1 diabetes in children, using a font of children's fridge magnet letters and toys which could suggest that the information is directed to children. The example on the right (Figure 2b) is a leaflet with childlike drawings that targets parents and reminds them to always put babies in their baby car seats.

a

b

Figure 2: H&S resources for parents depicting playful graphics that seem to target children: (a) poster for diabetes awareness, size A4, targeting adults (source: Diabetes UK, UK, 2015); (b) front of a two-sided leaflet about road safety, size A5, targeting adults (source: Dirección General de Tráfico Ministerio del Interior, Spain, 2015).

Other artefacts are specifically directed to children and are the subjects of this research. These resources frequently target children within an age range of 6 to 12, which is, therefore, the age group aimed in this study. Although sometimes the artefacts aimed at a narrow group (e.g. 5–8 or 8–12), this only happened in 10 out of 64 examples in the sample; the other material had a broad target, as further detailed in the analysis section of this research (see Figure 34 on page 47). Additionally, it seems a distinction is made between information for children and teenagers, but none for the different developmental stages within each broad age group. In a conversation with the Royal Berkshire Fire and Rescue Service, a risk reduction practitioner explained that drawings are used in materials developed by them for activities with children, as drawings are less frightening than photographs, which are more appropriate for teenagers because they present real life scenarios.

2.1.1 Corpus gathered for analysis

Despite the frequent use of printed resources, finding examples for this study proved to be a difficult task. After contacting institutions that produce H&S information for children and not having acquired many exemplars – many organisations send the materials to schools but not to individuals, which was my situation – I started finding them available online to download. Hence, the sample collected is formed of digital reproductions of resources that are also distributed in a printed version. An advantage of using online resources was the possibility of looking for them worldwide, which demonstrated that there is some visual consistency in H&S information for children in different countries.

Table 1: Distribution of H&S information examples collected for analysis by location.

Country	n
United States of America (USA)	24
United Kingdom (UK)	12
Australia	7
India	5
Portugal	4
Brazil	3
Spain	2
Canada	1
Germany	1
Iceland	1
Luxemburg	1
Europe	1
Worldwide	2
Total	**64**

The corpus gathered included resources from 11 countries (most of them highly developed); one example was directed to Europe in general, and two had a global reach, as shown in Table 1.

It was important to have a variety of topics to have a broader view and to identify whether there were visual consistencies or dissimilarities between the different topics approached. Within all possible H&S topics, the ones part of the sample acquired for this research were more related to safety than to health issues, although a few items relating to the latter also compose the sample. The most common topics were prevention of child abuse (12 examples), internet safety (11 examples), and road safety (10 examples). For more details on the sample's topics, see the next chapter's Table 3 on page 46.

The types of material collected include posters, flyers, and booklets. Within the sample, all these sorts of materials, regardless of their size, had visual similarities and therefore are considered without any distinction in the analysis. Although sometimes booklets may contain longer texts than the other two document types, the H&S booklets gathered, similarly to posters and flyers, had large illustrated areas and short texts (e.g. Figure 3a). Posters varied in size from A4 to A1 and formed the majority of the sample; they were the main focus and type of material tested in this research. When part of a broad campaign, H&S flyers for children usually reproduce the poster on a smaller scale; when found alone they still look like small posters [1].

Although the verbal information in posters is usually short and booklets in general tend to have more extensive text than posters, these were not standard rules in the sample analysed, as exemplified in Figure 3. On the left (Figure 3a) there is a page of a booklet about water safety showing three informative pictures with associated verbal information. The amount of verbal information in this page could be considered extensive for a poster; however, contradicting this assumption, the poster on the right (Figure 3b) has more verbal information than the booklet and also has, proportionally, smaller pictures, which are decorative [2]. Hence, booklets, posters, and leaflets were analysed as a single sample.

1 For example, the flyer in Figure 23 later on in the thesis can be encountered as an A4-sized flyer or as an A1-sized poster.

2 See 'decorative pictures', as defined for this thesis, in Chapter 3.

a

b

Figure 3: Comparison of the use of pictures and the amount of verbal information in a booklet (a) and a poster (b): (a) booklet for summer safety near water, size 17×24 cm, no specific age group identified as a target (source: Spanish Red Cross, Spain, retrieved in 2016); (b) poster about summer safety, size 15×22 cm, no specific age group identified as a target (source: Torah Tots, USA, retrieved in 2017).

2.2 Verbal and pictorial elements

Although this research mainly focuses on the use of *pictures* in H&S material for children, *verbal information* also has to be considered as it usually supports picture comprehension (Bieger and Glock 1985; Wright 1998; Houts et al. 2006). Both verbal and pictorial elements work together to transmit the message intended by the material, whether it be a poster, flyer, or booklet. As explained above, this research is mainly based on posters, which, according to Gardner et al. (2000), must be brief; in this brevity, verbal and visual elements might be complementary, each contributing their meaning so that sometimes one without the other makes no sense. Similarly, Kong (2006) suggests an interplay between picture and text, in which one element is not subordinated to the other but together they construct a message, even if sometimes one mode (pictorial or verbal) prevails over the other.

2.2.1 Pictorial elements

As mentioned earlier and found in the analysis of the sample gathered (Chapter 4), pictures are an essential feature of H&S information for children. Kress and Leeuwen (2006) say that the complex interaction between pictorial and verbal elements is often visual first rather than verbal. According to Gibson (1971, 34), 'not only do we perceive in terms of visual information, we also can *think* in those terms'. Visually perceiving would have permitted picturing to be a way of storing, accumulating, and transmitting knowledge for different generations (Gibson 1971, 34). The referent represented in a picture, whether it is a physical object or ideas and concepts, has to be presented in a way that allows it to be recognised and understood (Goodman 1976). For example, for the message of a picture to be comprehended, the depicted referent should be arranged in a familiar way for the observer and give the right cues for him/her to decode it. According to Mandler and Robinson (1978), the familiar arrangement of elements in a picture is especially important for children.

Five aspects of communication through pictures that should be considered are discussed next. These are pictures and attention, picture comprehension, the affective response to pictures, the cognitive impact of pictures, and pictures as disruptive elements.

Pictures and attention

An important aspect of pictures in information design is their function to direct the viewer's attention to the message. Specifically, when considering information designed for children, aesthetics could be an important factor in attracting attention. Peeck (1987) suggests that pictures serve an affective or motivational function for students, raising their interest and curiosity, creating a mood of emotion, and making reading a text more enjoyable. Likewise, Fang (1996, 140) argues that illustrations in picture books are meant to capture attention, 'to delight, to amplify or tell a story, to teach a concept, and to develop appreciation and awareness in children'. Zimmermann (2008), an illustrator and researcher, observed and talked to children for a study to identify and analyse relationships established among the illustrator, children, and

culture. During this study, she suggested that illustrations might be stimuli for reading since they fascinate the child and direct the child's look. Moreover, this author also reported that sometimes it is only after observing the pictures that children decide to read or not read a story in a book. In this sense, Levie and Lentz (1982) say that some pictures function as attentional pictures, as they defined them. In 'free reading' situations, according to Levie and Lentz, such pictures stimulate reading by directing the reader to choose texts carrying this type of picture. They argue, however, that in learning situations ('forced reading') pictures are less likely to direct attention and their function in supporting the cognitive processes of comprehension is more important to the learning process.

It is possible that some aspects of the pictures presented in H&S information for children could influence how well its message is transmitted. Therefore, an illustration could attract or not attract children's attention to a poster and could subsequently help or disrupt the communication of the information. Note that this section focused on the attentional function of pictures, as described by Levie and Lentz (1982), in situations similar to their description of free reading. The pictures' effect on learning the information is discussed in the following sections.

Comprehension of pictures

Children's background and perception of the world are relevant to how successfully pictorial elements communicate messages to them. Children are continually developing and are constantly constructing the way they perceive the world. They may interpret images in a different way from adults, as observed by Waterson and colleagues (2012) when testing train safety signs for children. In their study, children understood a frightened facial expression of someone trapped in a seat as frustration for not being able to balance on the seat.

Familiarity with the referent depicted and contextual cues are important for a picture to be comprehended as intended (Levie 1987, 8). Levie found that young children have difficulty understanding abstract, complex, and unfamiliar pictorial information. As previously discussed, familiar picture scene organisation is also important to young children in recognition and memorisation tasks, as their memory is highly dependent on activating familiar schemata (Mandler and Robinson 1978). Not only children but adults also benefit from contextual cues in effective message communication. Lesch and colleagues (2013, 1271) found that 'cues to knowledge' improve older adults' comprehension of safety signs. Likewise, Pike, Barnes, and Barron (2010) identified that the pictures might act as contextual cues to the text and facilitate children's inferential comprehension of the text. However, this was true only when the most relevant information was depicted in the picture, and not when representing information that competed or conflicted with the text, in which case pictures could have an interfering effect and may confuse the reader. Interestingly, working with storybooks instead of textbooks, Feathers and Arya (2012) demonstrated that children understand pictures as part of the plot, and when retelling the book's story, children would

include information from the pictures that was not in the text.

The above-mentioned studies suggest that children must be familiar with the pictorial elements depicted in order to understand the picture. Additionally, cues to the text and/or to their previous knowledge help them to understand the picture. Finally, the evidence that pictures can have an interfering effect on children's comprehension of text and are added to stories' plots suggests that pictures tend to be seen as part of artefacts' information.

Affective response to pictures

Another aspect that should be considered is the possible affective responses pictures trigger in the observer. Pictures can stimulate enjoyment or affect emotions and attitudes (Levie and Lentz, 1982), arouse curiosity and enjoyment (Peeck 1987), or delight and develop appreciation among children (Fang 1996). Affective response to pictures is believed to be relevant to the effectiveness of educational materials. Houts et al. (2006) refer to research which shows that people's affective response to pictures in health education materials can change people's intention and influence their behaviour positively or negatively. Equally, Joffe (2008) says that emotive pictures can make people engage in or disengage from certain campaigns, possibly because 'visuals are thought to send people along emotive pathways where textual/verbal material leaves them in a more rational, logical and linear pathway of thought' (Joffe 2008, 85). In her research, Joffe (2008) discusses the attempt to make pictures elicit specific emotions from people, such as fear and humour. Disgust, for example can have both persuasive and dissuasive impacts. The way people will react to a picture depends on their positioning and identification with the picture content (Joffe 2008, 90). Hence, emotion is difficult to predict or create, given

> *some picture content will elicit similar responses from most people, such as an icon, a picture of puppies or humorous cartoon characters, and therefore, can be expected to influence most people in the same way. Some pictures, such as photographs of a male doctor examining women's breasts, will elicit different responses from different people and, therefore, may have variable effects on behaviour. (Houts et al. 2006, 187)*

In relation to learning, Pekrun et al. (2002) investigated the impact of emotions on students' academic performance. They determined two dimensions of emotions that can affect performance: the valence of the emotion (positive-negative) and activation. Positive emotions, according to them, can be activating (e.g. enjoyment, hope, pride) or deactivating (e.g. relief, relaxation). Likewise, negative emotions can be activating (e.g. anger, anxiety) or deactivating (e.g. boredom, hopelessness). Using this theory and Pekrun's (2006) finding that positive emotions strengthen the motivation to learn while negative emotions are harmful to learning, Um and colleagues (2012) studied the possibility of designing multimedia learning [3] environments that would induce positive emotions to enhance the comprehension of their contents. For this study, they used specific colour combinations and visual shapes, avoiding adding a significant amount of new information to the multimedia environment. Um and

3 'Multimedia learning refers to learning from words and pictures' (Mayer 2014b, 3).

colleagues called these design effects *positive emotional design*. They led two studies testing these materials on students, and the results indicate that emotional design induced positive emotions and the positive emotions facilitated cognitive processes and learning. This study was later replicated by Plass et al. (2014), who partially repeated the previous findings. Using the same materials, they found that students reported less difficulty in only one of the two experiments conducted and that no group outperformed the control group.

Building upon these studies, Mayer and Estrella (2014) also focused on the emotional design [4] principles applied to graphics in multimedia learning lessons. Initially, they determined that interesting but irrelevant graphics that focus the learner's attention on extraneous content have negative effects on learning. On the contrary, interesting graphics that concern the essential content of the lesson help learning. Thus, Mayer and Estrella (2014, 13) believe that applying emotional design principles to graphics in multimedia lessons needs 'to tap affective processes that prime cognitive processes leading to improvements in learning (…) while not distracting the learner from the essential content of the lesson'. To do this, they made the essential elements of the lesson more appealing than simply adding interesting but irrelevant graphics. In their study, Mayer and Estrella enhanced the graphics of a lesson by maintaining their essential characteristics but adding some human-like characteristics (e.g. faces with expressive eyes, indicating surprise) and appealing colours (e.g. red, blue, and yellow). They found that the personification and visual appeal of important elements focus the learners' attention on the relevant aspects of the graphics.

These and other studies focusing on the affective response to pictures from a cognitive point of view are discussed in Chapter 5.

4 Mayer and Estrella (2014, 12) 'use the term emotional design to refer to redesigning the graphics in a multimedia lesson to enhance the level of personification and visual appeal of the essential elements in the lesson'.

Pictures' cognitive function

Pictures also have a cognitive function (Levie and Lentz, 1982), which relates to how pictures can facilitate learning the information in a text – and not just looking at the pictures alone. There are various theories about how this assistance happens. According to Levie and Lentz (1982), pictures provide context for understanding the information and stimulating readers to increase their depth of semantic analysis. This positive effect could happen because presenting an idea from the text in a different manner could eliminate ambiguities that could have been expressed in the text (Norman 2010). Levie and Lentz speculate that pictures 'help to keep the relationships between key concepts at ready access, freeing the learner's processing capacity for other aspects of the learning task' (1982, 222). Mayer's (2005) cognitive theory of multimedia learning(CTML) [5] explains how learning from pictures and words combined is more effective than learning from words alone. CTML focuses 'on cognitive processing during learning within a working memory of limited capacity using knowledge activated from a long-term memory with unlimited capacity' (Mayer and Estrella 2014, 13).

5 For more about the cognitive theory of multimedia learning, see Chapter 5.

Pictures as disruptive elements

Despite the widespread use of pictures in various communication models, there is no consensus between researchers about how much pictures improve communication. Some studies, mostly in regard to school textbooks, suggest that pictures could be disruptive to learning from a text. Schnotz and Bannert (2003, 153), for example, suggest that 'pictures can also have negative effects because a picture may interfere with mental model construction'. These authors believe that pictures are beneficial to learners with low prior knowledge but only when the subject matter is visualised in a task-appropriate way. According to them, if a high prior knowledge learner visualises the subject matter in a task-inappropriate way, pictures could interfere with the task-appropriate mental model construction. Similarly, Kalyuga (2014) describes the expertise reversal effect, in which some design strategies in multimedia learning hinder learning for high prior knowledge learners. Additionally, Levie and Lentz (1982), grounded on the dual code theory, assume that poor readers benefit more from illustrations than skilled readers because they rely on the pictures more often than on the text. Likewise, Mayer and Gallinini (1990) demonstrated that illustrations improved recall of conceptual and creative problem solving mainly for low prior knowledge students.

On the other hand, Hannus and Hyönä (1999) looked at children's recall of illustrated texts while observing their eye movements when reading and found contrary results to those noted above. In their study, Hannus and Hyönä determined that more capable children benefit more from illustrations than less capable children when learning from science textbooks materials. They suggest that 'learning is heavily driven by the text and that children inspect illustrations only minimally' (1999, 95); they agree with Peeck (1993), who suggests that readers do not pay enough attention to pictures. Hannus and Hyönä also discovered that the high-ability students were more strategic when looking at verbal and pictorial information, spending more time on each one's most pertinent parts.

Besides the ability of the reader, the relationship of the picture with the verbal information could also influence the material effectiveness. Previous research has shown that illustrations are beneficial for learning from the text when they are relevant to the text's content (Levie and Lentz 1982) and that decorative pictures have no effect in helping learning from text (Levin, Anglin, and Carney 1987). Mayer and Estrella (2014) discuss research that has shown that adding interesting but irrelevant graphics (which they refer to as seductive details) to educational materials had negative effects on learning and that decorative pictures (neutral illustrations with no instructional role, in their deffinition) have no consistent positive effects on learning. Pictures depicting relations increased recall of the relations in highly and moderately skilled comprehenders but not for less skilled comprehenders (Waddill and McDaniel 1992). Pike, Barnes, and Barron (2010) say that for pictures to be efficient they need to depict the most relevant information and act as contextual cues to the text, as discussed earlier. On the contrary, according to them, illustrations representing

information that competes or conflicts with the text may interfere with and confuse the reader.

Nonetheless, all these above-mentioned studies were made in regard to pictorial and verbal information in textbooks. H&S information has different objectives and functions from textbooks (as further discussed in section 2.2.3 on page 15). Taking into account the fact that textbooks have a larger amount of verbal information than H&S posters, pictures usually complement the verbal information and do not play the bigger role. Hence, perhaps the benefits of pictures are different in these two types of resources.

2.2.2 Verbal elements

Verbal elements could be studied in two ways: according to their visual features (Twyman 2002) and according to their linguistic meaning. The first considers them to be graphic elements that are formed of shapes and colours that can transmit information, similarly to pictures; the second considers their meaning to be a linguistic representation of a referent. As visual features, colours can be used in a certain way; red, for example, can be used to make the signal word of a warning salient and indicate danger (Wogalter, Conzola, and Smith-Jackson 2002), and typography can influences people's perception of a document (Moys 2013). Legibility and readability of the verbal information are not investigated in this research, and their impact on children's reading has been addressed in other studies such as those of Walker and Reynolds (2003) and Hughes and Wilkins (2000). These studies were conducted regarding continuous reading, and although the typefaces in short sentences on posters might have a different impact on children's reading, the main interest of this research is the pictorial information. The linguistic meaning, however, is significant since it helps the understanding of the instruction (Bieger and Glock 1985), and although it is not central to this research because it was held consistent across conditions in the experimental studies (Chapters 6 and 7), it provides the context within which pictures should be understood. Houts et al. (2006) point out that different people can interpret pictures in diverse ways. To minimise the different interpretations, text associated with the picture usually guides the interpretation. Houts and colleagues stress, though, that people with limited reading skills may ignore the text and try to understand the message by guessing the picture's meaning. Thus, they suggest simplifying the language used in these texts to improve communication about health, as poor readers more easily understand a clear text than a complex one. Although this recommendation is made for communication with adults, it seems plausible to consider it in H&S information for children, especially in the age range of 6 to 12 included in this research, which embraces children with different reading skills across this age group.

Four observations from previous research about verbal information on a range of areas, including safety and general instructions, are relevant to this thesis.

- Wording components: Wogalter, Conzola, and Smith-Jackson (2002, 221) define four wording components for an effective warning:

'(1) signal word to attract attention, (2) identification of the hazard, (3) explanation of consequences if exposed to hazard, (4) directives for avoiding the hazard';

- Positive vs negative instructions: Wright (1998) says that information can be understood at many levels and that contextual and linguistic factors combine to determine how people understand them. Reinforcing this point, Wright cites two studies about positive and prohibitive instructions. The first evidenced that people recall affirmative instructions better than prohibitive instructions (File and Jew 1973); and the second shows that additional information can make negative instructions efficient (Barnard and Marcel. 1984);

- Explicit and definite wording: Heaps and Henley (1999, 350) found that 'explicit and definite wording in product labels result in a generally more believable warning', although this credibility does not necessarily influence a safer behaviour;

- Simple language: Pictures will be more easily understood when the accompanying text is clear (Houts et al. 2006, 188).

These findings, however, refer to adults understanding of messages and their compliance with them. Although Rice (2013) suggests that signs for children follow the same guidelines as those for adults, this assumption is treated with caution in this research as there is not much evidence to support it – or to contradict it – as discussed next.

2.2.3 Similarity and dissimilarity between textbooks and storybooks

The lack of studies about H&S information for children pushes this research to refer to theories from other areas to understand printed communication of information to children. Storybooks and school textbooks [6] are to some extent comparable with H&S posters for children since they use pictorial and verbal elements to communicate messages, although three main differences between these sorts of materials might have consequences for their visual design. First, the objectives of these materials are different. Textbooks, for instance, can be considered information design materials (Frascara 2015); however, this type of book is intended to teach a subject and to address a demand for academic knowledge defined by governments, which is to teach a subject to children so they can apply this knowledge during their lives in different situations (academic or not) for various purposes. H&S information aims to influence a particular behaviour of an immediate and specific task (such as safely crossing the street), even though this behaviour should be prolonged into children's lives. To a certain extent, H&S information is more isolated than academic knowledge since it is not directly linked to other topics in the way that academic knowledge is linked to other topics and activities of academic life. Storybooks, on the other hand, explore illustrations to tell stories with texts in an attempt to make children think about social and personal issues and/or entertain children, for example, but not to give direct instructions, as H&S information does.

Second, the different types of subjects treated in textbooks, storybooks, and H&S information might influence the design of their

6 School textbooks, called just 'textbooks' throughout this thesis, are educational books used in schools as a standard text for studying a particular subject.

pictorial and verbal elements, and the page layout. The pictures in textbooks often need to explain difficult or abstract concepts of formal educational knowledge (Hannus and Hyönä 1999). Thus, the pictures in textbooks are usually literal and schematic images that represent things for what they really are. Because of this, the pictures should transmit the message with little ambiguity. The illustrations in storybooks do not have to be literal and can be open to multiple interpretations. Zimmermann (2009) shows that in these books, more than just understanding the story, children are stimulated to use their imagination and interpret pictures in their own way, even if this is not in the exact way the story was intended to mean. Thus, the pictures in storybooks can be abstract or even nonsensical, stimulating children's creativity (Fang 1996) and imagination. Even though the intentions of illustrations in storybooks (openness to interpretation) are likely to be different from those in H&S information for children (closed/directive illustration), which is similar to the intention regarding pictures in textbooks, H&S pictures – in the sample gathered – mostly resemble storybooks' and not textbooks' illustrations (see the analysis of the sample in Chapter 4).

Third, H&S materials and books usually rely on different amounts of verbal information. The former have little verbal information whereas textbooks and often storybooks (considering the whole artefact and not separate pages) have extensive verbal information. Still, since studies about the two types of books usually demonstrate an existing concern around understanding how pictures influence communication of significant information to children, they are relevant to this research. It is worth pointing out, however, that most of the studies accessed focused on pictures in books and how they assist or fail to assist children in reading the text and learning the presented information therein (e.g. Peeck 1993; Faust 1995; Hannus and Hyönä 1999; Norman 2010). Few studies were found regarding how children understand other types of information such as that in safety warnings or in materials teaching children how to behave in specific situations (e.g. Hämeen-Anttila, et al. 2004; Martin and Smith-Jackson 2008; Waterson, et al. 2012). These studies and others that were carried out in order to understand the efficiency of campaigns for children frequently take a behaviour change point of view (Zeedyk, Wallace, Carcary, Jones, and Larter 2001; Huhman et al. 2005; Hoekstra and Wegman 2011) and not a design point of view. This approach might be appropriate in a setting in which the researchers are examining the effectiveness of a specific campaign or a particular approach to presenting information, but it does not isolate the impact of specific aspects of the campaign on behaviour in ways that could be applied across settings. They do not specifically evaluate the influence of pictorial and verbal elements on the achievement of the campaigns' goals.

The overview of the H&S information for children studied in this thesis shows the peculiarity of this sort of material: it aims to instruct children similarly to textbooks but with less verbal information, using visual elements that are similar to those in storybooks. Although somewhat comparable to storybooks and textbooks, H&S information

has different objectives, includes a different amount of information, and results in different interactions with children than books. Moreover, due to a lack of research in this area and an absence of guidelines for designing information for children, this chapter points to the need for a framework to analyse H&S information for children and generate data about its typical features in order to understand the communication features of this sort of material.

Chapter 3 | Framework for analysis

To analyse a sample of H&S information for children, a framework was designed that emerged from the literature review and direct engagement with the sample. This chapter discusses how verbal and pictorial information that compose these materials contribute uniquely to the message communication. Initially, methods of analysis are discussed in order to determine appropriate ways of analysing the particular sample gathered. A combination of descriptive analysis (Walker 2006; Gillieson 2008; Walker 2012) and content analysis (Krippendorff 2013) served as a base for the framework. The categories within the framework derive from Goldsmith (1984; 1987) and Twyman (1985), and from the specific characteristics of the examples. Bearing in mind that the sample represented a subset of H&S resources, available across different countries, the analysis was carried out to differentiate particular features of this group of examples rather than to provide a comprehensive analysis of this sort of material, although it is likely to be indicative of the wider set. Later in this chapter, each category of three levels of information determined for the framework is explained with examples from the sample of H&S information gathered.

3.1 Methods of analysis

Descriptive and content analyses methods isolate and describe features or units of selected samples. With similar ways of acquiring data, they have distinct objectives that they reach by observing different aspects of any given material. The first method reports the behaviour of variables in specific situations regardless of their meaning to people, whereas the second searches for the meaning of the content and its probable effects on people (Krippendorff 2013). As its name suggests, descriptive analysis describes the object of analysis, which is appropriate for identifying tendencies in a sample. One valuable tool of this method is the checklist with which typical visual features of the sample analysed can be identified. According to Walker,

> *using a checklist ensures that the same approach is taken to 'looking' at each of the items in a particular corpus. Each 'feature' is further subdivided into variants, attributes or states – that describe the variations that might occur within a particular feature. (2012, 187)*

Walker (2012) uses a checklist of features of visual organisation to describe the graphic language of children's books using an analytical approach. The graphic languages are then related to external factors (e.g. a book's readers, technology of production) that might have influenced changes in the graphic languages over time. Likewise, Engelhardt (2002) proposes a descriptive framework to analyse the syntax of graphic language, aiming to make it comprehensive (that considers various aspects of graphics, and that is possible to be applied to any graphic representation) and unifying (that attempts to refer to most existing theories and concepts of visuals). These two authors' descriptive approaches focus on materials' *physical aspects*.

Content analysis is an observational method used to systematically evaluate the *content* of all sorts of communication (Bardin 1977; Kolbe and Burnett 1991; Krippendorff 2013). In this method, a pre-analysis is made by briefly reading/looking at the material and identifying key symbols and themes to be classified, tabulated, and evaluated. In other words, the categories of analysis emerge from the sample. By examining the data, it is possible to infer the meaning of the information within the material and its probable effects. The framework of analysis proposed here has a checklist format that provides a description of the materials' visual features combined with an analysis of their content. These methods together enable the identification of typical features of H&S information for children and possible correlations between the categories that emerge from the sample and related theories.

3.2 Framework axes

The framework developed (full framework in Figure 33) for this thesis is formed of two axes, called *Components* and *Levels*. *Pictorial elements*, *verbal elements*, and interaction between *pictorial and verbal elements* are the main features analysed and constitute the horizontal Components axis. Three significant aspects of the components constitute the Levels axis: *physical characteristics*, *content*, and *purpose*, and originate the categories of analysis. Table 2 below shows how the two axes are constituted; the blank cells at the intersection of the axes indicate where the categories of analysis are inserted in the framework.

Table 2: Two axes of the framework, Components (pictorial, verbal, and pictorial & verbal) and Levels of Information (physical characteristics, content, and purpose) and their subdivisions form the categories of analysis.

		Components		
		Pictorial	Verbal	Pictorial & verbal
Levels of Information	Physical characteristics			
	Content			
	Purpose			

Components axis

Although the main focus of this research is the pictorial information in H&S material for children, verbal and pictorial elements work together, and it would be inappropriate to analyse one without considering the other. Kong (2006) highlights the importance of the interaction between pictures and words in communicating messages, separating them into distinct categories, and taking into account the linguistic meaning of words and not their graphic representation. A more comprehensive approach is taken by Twyman (1985), who considers that written words are also visual elements. Twyman defines types of language in the model reproduced in Figure 4 (next page). He believes that 'graphic language' can be verbal, pictorial, or schematic, placing verbal and pictorial at the same level of importance and therefore making it possible to analyse both under the same circumstances. Using his model, the visual meaning of words can be considered rather than just their verbal meaning.

Twyman (1985) proposes variables [7] for all the types of graphic language in his model; some of them influenced the construction of the framework created in this thesis. To define the Components axis,

7 Twyman (1985) proposes eight variables: purpose, information content, configuration, mode, means of production, resources, users, and circumstances of use.

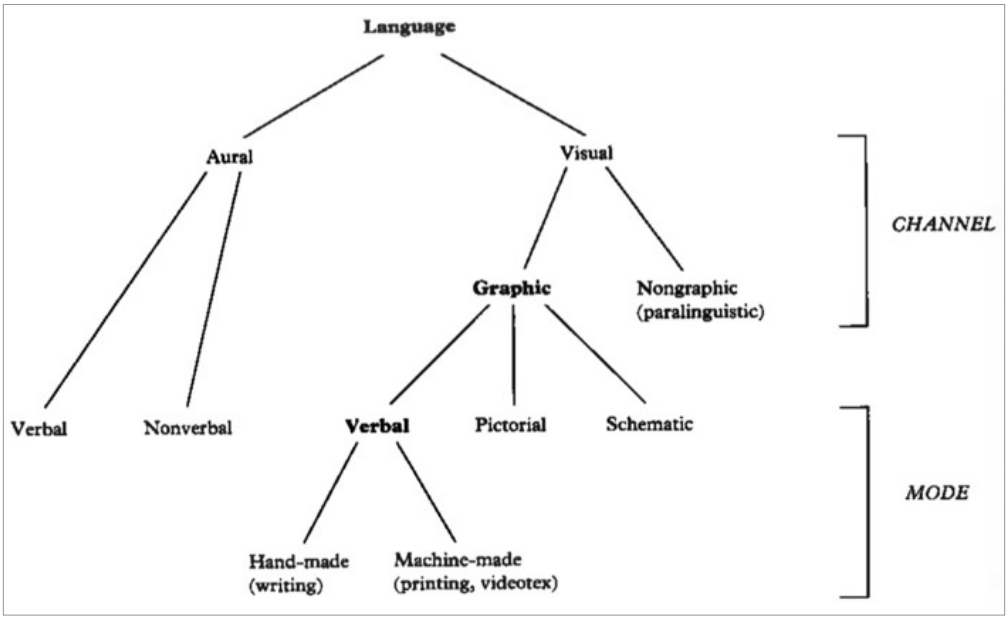


Figure 4: Model devised to accommodate the approaches to language of linguistic scientists and graphic designers. Source: Twyman 1985, 246.

Twyman's variable 'mode', which refers to the categories of language, is used. According to the types of language defined by Twyman, schematic graphics were not found in the examples of H&S collected and are not included in the framework proposed here. 'Verbal' and 'pictorial' appear in the vast majority of the sample, and thus they form the Components axis. The variables 'purpose', 'information content', and 'configuration' recommended by Twyman inspired the levels of information analysed in the framework, as did Goldsmith's (1984; 1987) analytical model; both are discussed in the next section. Another Twyman variable, 'users', which he takes to mean the population targeted by the information, is not part of the materials, although designers produce artefacts according to their understanding of the users. Thus, even though 'users' was not a category of analysis, it was tracked as a descriptive feature of the corpus gathered and became an important influence on the research, as discussed in the next chapter.

Levels axis

The categories of analysis defined for the framework can be grouped into three blocks concerning the aspect of information they refer to: *physical characteristics*, *content*, and *purpose*. These levels of information are based on Twyman's (1985) model and variables ('configuration', 'information content', and 'purpose'), as previously mentioned, and Goldsmith's (1984; 1987) analytical model for analysing illustrations. Goldsmith considers the interaction between three levels of communication – syntactic, semantic, and pragmatic – and four visual factors – unity, location, emphasis, and hierarchical relationships. Although the proposed framework levels are influenced by syntactic, semantic, and pragmatic qualities, they are not precisely distributed according to them as at this stage of the research, the framework objective was to determine typical features of H&S information for children.

The framework's first level of information is called physical features since they are the features first noticed in a visual artefact. The interpretation of an image starts by the viewer detecting and

acknowledging it exists (Goldsmith 1984; 1987), which is possible through its physical features. The elements of the artefact are physically organised on the page (Twyman 1985) and their organisational aspects are also relevant and are considered at this first level.

The content level concerns the message conveyed by the physical features. Relating to Twyman's (1985) 'information content' variable and Goldsmith's (1984; 1987) definition of semantic unity, this level is more subjective than the first one since it depends on the viewer's ability to understand the message. Some categories of this framework's level are easier to decode than others. The 'main character', for instance, is usually identifiable, as one can presumably differentiate people from animals, for example; and it is likely, in H&S information, that the person is the focus of the communication, i.e. the character with which the user is intended to identify. The category 'picture atmosphere', on the other hand, involves decoding more subjective features (e.g. meaning of colours and facial expressions) than those necessary to identify a character and therefore it is more complex to understand. For Goldsmith (1987, 55), context can be used to help to identify the object, but this depends on the viewer's culture, age, interests, education, and so on. Note that for the purpose of the analysis of the sample, I assumed children would understand the codes designed, so the analysis is according to what I assumed to have been the designers' intention.

Likewise, the third and final level of information, purpose, is dependent on the viewers' understanding of the scenes depicted. Take, for example, the situation described in Chapter 2, in which children misunderstood the behaviour depicted in a drawing of a child trapped on a train's seat as frustration because they could not balance on the seat. Thus, for the analysis, the designer's point of view is used again in that the intention behind the production of the material is considered. Twyman (1985) says the purpose of any visual could be to communicate information or to persuade. This framework investigates the purpose further by detailing the intentions of pictorial and verbal elements individually and in relation to each other.

In summary, three levels of information were defined to analyse the components (i.e. verbal, pictorial, and both of them together) of H&S information for children. Physical features level refers to what people see at first glance, which are the visual characteristics that attract people's attention. Content is what the physical features communicate after interpretation, and this depends on the viewer's ability to understand the conventions. Purpose relates to what information the individual components are intended to transmit and also depends on the viewer's understanding.

3.3 Categories of analysis

The definition of the categories for the framework emerged from the sample of H&S information for children collected, and pertinent theories with reference to other relevant frameworks. The categories were initially roughly delineated after reviewing the sample to build the framework. Following, the process of defining these categories,

coding of the individual items required returning to the sample multiple times. Discussions with other researchers and thesis supervisors were fundamental to determine descriptors that were appropriate to the framework's objective and the sample characteristics. During the analysis of the sample (see Chapter 4), some shortcomings in the framework were identified, and some categories were excluded and others included to better fit the objective of the analysis. For example, initially, there were two 'colours' category, each one analysing pictorial and verbal elements individually. However, little variation between the two was identified in the sample, and the viewer initially perceives the colours of a poster as a whole; additionally, this research did not intend to verify the use of or preference for specific colours, hence this category was modified to analyse both pictorial and verbal elements together.

Note that the selection of the categories depended on my own analysis and, although they were explained to and discussed with others in order to validate the selection, it is possible that another researcher could take a different perspective and choose different categories, even with the same sample set. Nonetheless, as mentioned above, the process of developing the framework was organic and fluid and responsive to the sample. Before confirming the framework another researcher made an independent analysis of the 64 examples in the sample, and reached 90% agreement with my analysis. Some discrepancies related to a category 'size of illustrated area' in which there was ambiguity about what to include or exclude from the categorisation. This category was then redefined as two categories, 'size of figurative pictures' and 'size of combined illustrated area'. Another issue related to my classification of 'verbal information atmosphere, which was initially classified as cheerful and serious, but then modified to 'active' and 'neutral'. The new categories and classifications were then discussed with other researchers who agreed with the modifications made.

Each category aims to describe and analyse the H&S examples to provide a better understanding of this sort of material. Some of the categories appear across all components (pictorial, verbal, and pictorial and verbal interaction), and others are specific to each kind of component. For the following discussion, the categories are grouped in the levels to which they belong.

3.3.1 Physical characteristics level

Physical characteristics are the first features noticed in informational material, as discussed above. Thus, their initial role is to attract people's attention to the artefact. For example, for Wogalter (2002), making a sign noticeable is the first rule of making it efficient, and to achieve this goal he suggests using physical features such as colours and contrast in appropriate ways.

Among the several aspects of physical features that could be analysed, some of them, such as drawing techniques and the use of specific colours, are not aligned with the proposed framework. This is because isolating such graphic characteristics and testing them with children could result in personal preferences/culture/experiences specific to each group studied having an influence (Marcus and Gould

2000). Although the perception of each of the three levels analysed here is culturally constrained, personal preferences regarding physical characteristics are not the major concern of this research and therefore are not studied in depth. The physical features that indicate the picture's content and purpose (respectively, the second and third levels of the framework) are more relevant than the children's preferences for specific physical characteristics such as style or colours.

Having said that, eight categories, observed in the sample, fall into the physical characteristics level of the framework. They are called *type of picture*, *synoptic images or discrete elements*, *size of figurative pictures, size of combined illustrated area*, *primary and secondary verbal information*, *primary verbal information conspicuity*, *colours,* and *integration of pictorial and verbal elements* and are discussed next.

Type of picture

Evidently, the type of picture is a category particular to pictorial elements of the H&S information collected. The physical characteristics of verbal components such as the use of serif and sans serif fonts, as previously discussed in Chapter 2, would require different research and therefore were left outside the framework. The type of picture is classified in the framework as *drawings*, *photographs*, or a combination of *photographs and drawings*. The analysis does not consider different styles within these types of pictures for two main reasons: the personal preference issue discussed above, and the lack of agreement in the terminology that describes styles.

Before moving to examples of type of pictures, a few words about the definition of styles are worthwhile to clarify the reason for not analysing them. Pictures are often described as line drawings, photographs, black and white, schematic, silhouette, coloured, simple, complex, and so on (Goldsmith 1987; Spinillo 2000). Spinillo (2000) accurately points out that these terms consider different variables and are not objective in classifying styles. Additionally, other types of style classifications can cause misunderstandings originating from different words describing the same styles and from same words describing different styles. For example, the word 'cartoon' is used to refer to humorous and exaggerated simple (i.e. few details) drawings (Dalacosta et al. 2009); or to written text in a dialogue with a visual stimulus (Keogh and Naylor 1999); or even to indicate drawings based on cartoon animations such as Disney style (Ryan and Schwartz 1956; Kennedy 1974; Bishko 2007).

I could, of course, have defined more granulated styles than just drawings and photographs. However, besides possibly being subject to personal preferences when tested, this classification could also result in a different type of research focusing on the influence of the pictures' styles on comprehension rather than on their content. Spinillo's work (2000; Spinillo and Dyson 2001), for example, discusses how different picture styles affect the comprehension of the picture and, consequently, influence the comprehension of the information. Based on research with adults about procedural pictorial sequences, she says that understanding line drawings depends on their degree of simplicity; the best choices

for recognising details seem to be photographs with the background removed and detailed line drawings; she also notes that schematic pictures can be confusing and misunderstood (Spinillo 2000). Houts et al. (2006) agree and say that in health materials for people with a low level of literacy, the best approach is to use the simplest drawings or photographs possible and to always consider the culture of the intended audience.

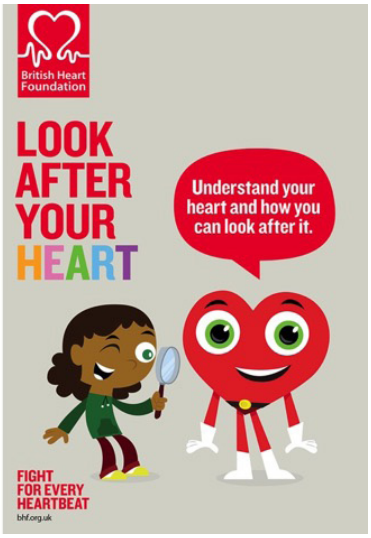
If these findings noted above are true for adults, there are likely to be some parallels for children, considering they may be less constrained regarding making a conventional interpretation. Children have more difficulty than adults in decoding pictorial information that is abstract and complex (Levie 1987). Familiarity with what is depicted is important for a good understanding for both children and adults (Mandler and Robinson 1978; Levie 1987; Spinillo 2000; Spinillo and Dyson 2001), which means they must have previous knowledge of the objects depicted to make sense of a picture. These issues are related to the content of the pictures and, for this research, are more important than the style used, which varies widely in H&S information for children. Furthermore, this research focuses on the effects produced by the pictures, such as children's responses to the pictures scene, rather than responses to the style.

So why differentiate between drawings and photographs at all? Because in a broad view of the sample gathered it became evident that photographs are rarely used in H&S information for children, as discussed in Chapter 2. Hence, when developing the framework it seemed important to identify the circumstances in which they appear.

Thus, the word 'drawing' was chosen to describe all the illustrations that are not photographs, which is a clear and understandable way of referring to this sort of picture in the sample collected. The term drawing embraces different methods of production (e.g. hand drawing, digital drawing) and techniques (e.g. pencil, watercolour, pastel chalk). Finally, even though the different styles might have an impact on how children visualise and understand the information communicated in the material – as pointed out above, some styles might be easier to understand than others – this is not the focus of this research.

Three examples of the use of drawings and photographs (i.e. separately and combined) can be found in Figure 5 (next page). The British Heart Foundation has several different types of materials for parents, children, and teenagers, and their visual communication is specific to each age. Figure 5a shows the cover of one of its booklets in which drawings similar to those on the cover are used throughout the booklet. Photographs are used in the leaflet in Figure 5b to stimulate children to be active by playing dodgeball in primary school. Finally, Figure 5c shows drawing and photographs used together in a booklet that aims to help teenagers who are going to the hospital for a heart procedure.

a

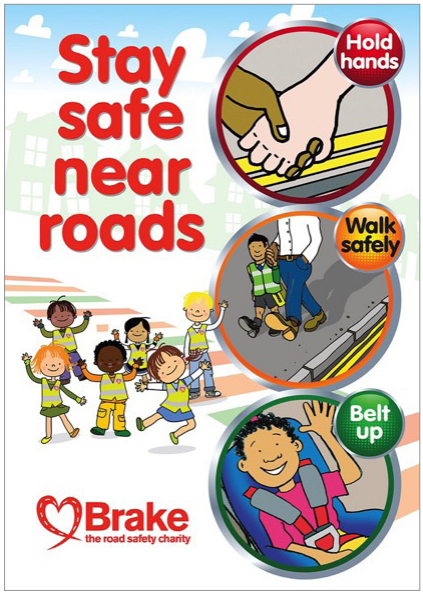


b

c

Figure 5: Examples of the three types of pictures in H&S information for children determined in the framework: (a) drawings on the cover of a booklet about heart health, size A4, targeting 7- to 11-year-olds (source: British Heart Foundation, UK, 2015); (b) photograph on the cover of a booklet, size A4, targeting parents and children (source: British Heart Foundation, UK, 2016); (c) drawings and photographs on a page of a booklet about heart health, size A4, targeting teenagers (source: British Heart Foundation, UK, 2015).

a



b

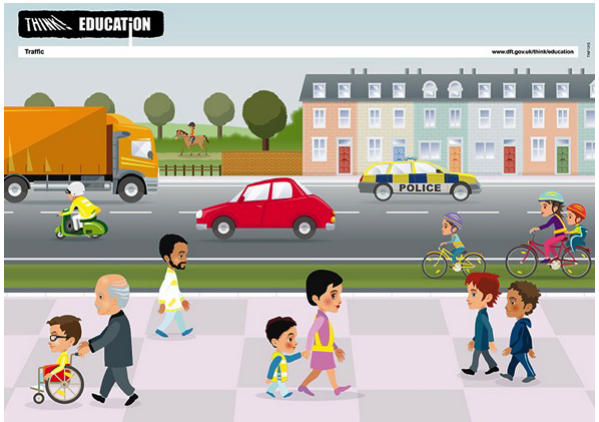


Figure 6: Examples of discrete and synoptic images: (a) discrete elements formed of four pictures, three inside the circles on the right and one on the left side, in a road safety poster, size A4, targeting 5- to 11-year-olds (source: Brake, UK, retrieved in 2016); (b) synoptic image on a road safety poster from the Think! Campaign, size A3, targeting children (no specific age range identified) (source: Department for Transport, UK, 2009).

Synoptic images or discrete elements

The pictorial information can be classified in the framework as *synoptic* or *discrete*; which classification is given depends on the number of individual images in the artefact. A synoptic image is 'a single unified representation of part of the world or an imaginary world' (Twyman 1985, 269). Discrete elements do not depict just one scene but represent separate elements that can be organised in many ways (Twyman 1985, 269). Although this category is simplistically determined by the number of images, the implications of conveying information in one way or a different way are significant. Discrete images have advantages in that they can focus viewers' attention on different aspects of an object or scene (Twyman 1985). On the other hand, Mandler and Robinson (1987) have shown the importance of context in children's recognition of scenes, which may be better perceived in a synoptic image.

Both examples in Figure 6 approach the same topic and show road safety practices; one uses discrete images and the other uses a synoptic image. The example on the left (Figure 6a) is a leaflet by the Brake charity for road safety, and the one on the right (Figure 6b) is part of the Think! Campaign of the Department for Transport; both examples are from the United Kingdom. Figure 6a is composed of discrete elements showing four individual pictures that represent four different attitudes (holding hands; holding hands with an adult and wearing a safety vest; using the seat belt in cars; and children happy on a zebra crossing).

Figure 6b shows some of these same attitudes (e.g. holding hands, wearing a safety vest) plus others (e.g. wearing a helmet while riding a bike) inserted into a bigger scene, a synoptic image. The poster in Figure 6a seems to emphasises each issue, and the poster in Figure 6b requires the viewer to contemplate the scene in order to identify all aspects depicted. Nonetheless, for now, the framework only aims to identify which approach is more often used, *synoptic images* or *discrete elements*.

Size of figurative pictures

Size is generally used to emphasise information and attract viewers' attention (Wogalter, Conzola, and Smith-Jackson 2002; Kong 2006; Ware 2013;). The size of the picture being analysed is considered in relation to the page on which it appears and not in comparison to other material. For instance, a relatively small picture in an A2-sized poster could be bigger than a large picture in an A4 poster. The picture is considered *small* if it uses up to one-third of the page, *medium* if its size uses up to two-thirds of the page, and *large* when the picture uses up to the whole of the page.

In this category I only consider figurative pictures and not other abstract/ geometric shapes. See, for example, the poster in Figure 7, in which the figurative picture is defined by the blue outline overlaid on the poster that occupies less than a third of the page. The yellow rectangle at the top of the poster is not taken into account when defining the picture size because it is not figurative.

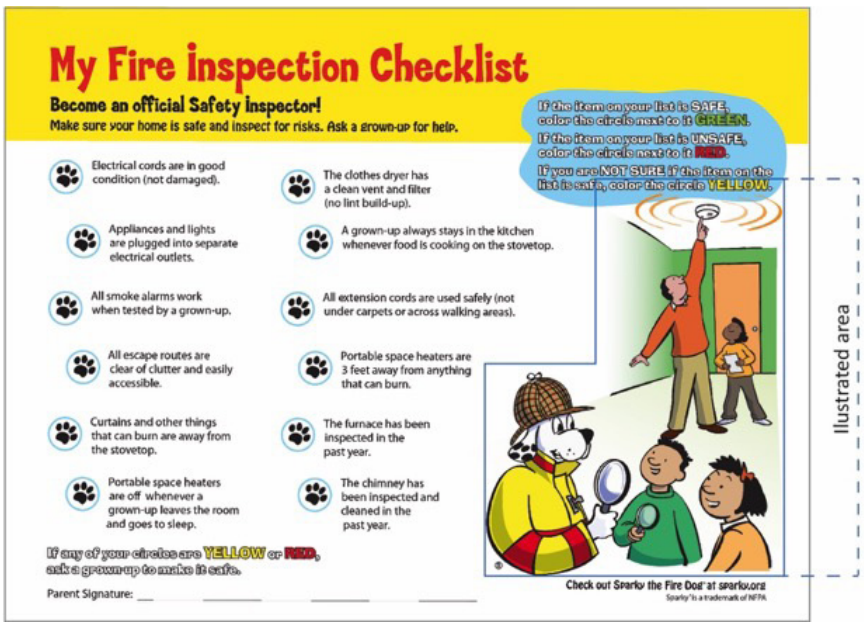


Figure 7: Example of a small figurative picture – contoured in the figure – in a fire safety poster, size A4, targeting children (no specific age range identified). Source: NAFPA, USA, 2015 [I added the highlighting on the picture].

The poster in Figure 8 (next page) has medium-size figurative pictures. If they are all put together, all rectangular pictures occupy an area that is bigger than half the page, occupying up to two-thirds of the page and therefore categorised as medium size.

Figure 8: Example of a medium-size figurative picture in a Lego fire safety poster, size A4, targeting children (no specific age range identified). Source: NFPA, USA, 2013.

Figure 9: Example of large figurative pictures in a poster about internet safety, size 37x26 cm, targeting 6- to 10-year-olds. Source: SeguraNet, Portugal, 2016.

The poster from Portugal, in Figure 9, has three pictures telling a short story about Pisca, a character created for this campaign, who is not always online in his free time and plays outdoors with his friends. All of the pictures in this poster combined occupy almost the whole page.

The three resources noted in Figures 7, 8, and 9 above are all shown in Figure 10 side by side for better comparison of the different sizes of the figurative pictures. The artefacts' original sizes are represented proportionally.

a

b

c

Figure 10: Comparison of the sizes of the three figurative pictures, (a) small figurative pictures in an A4-sized poster in which the picture takes up less than one-third of the poster; (b) medium-size figurative pictures in a poster, size A4, in which the pictures combined occupy up to two-thirds of the page; (c) large figurative picture in a poster, size 37x23 cm, in which the pictures together use almost the whole page.

Size of combined illustrated area

There is an issue in only considering the above figurative pictures in this framework. See, for example, Figure 11, which has four small drawings of children and adults spread around the poster. The rest of the artefact is composed of colourful shapes that organise and emphasise the verbal information. Although they are not figurative pictures, they could be seen as illustrations, as could the yellow rectangle in Figure 7 and the blue arrow-like shapes in Figure 8, both above. Likewise, sometimes the

Figure 11: Example of small figurative pictures with colourful shapes in a poster about child abuse, size A4, targeting school children (no specific age range identified). Poster source: VIBGYOR schools, India, 2014.

Figure 12: Example of a poster with primary and secondary verbal information. The headline at the top presents the topic, and the short blocks of text describe each action in each picture; the poster is A4 size and targets 5- to 11-year-olds. Source: School Supplies, USA, retrieved in 2017.

verbal information is designed in such a way that it looks like pictorial information (see Figure 13b and later Figure 22a, for example). A subcategory was created to identify the size of all combined illustration-like elements in the material analysed. Following the same rules as described above for the picture size, the size of the combined illustrated area can be *small*, *medium*, or *large*.

Primary and secondary verbal information

H&S information for children might contain *primary* and *secondary verbal information* combined or just the former. The classification of verbal information into two types is not exhaustive, and there could be tertiary or further levels of verbal information, but for most posters in the sample a division between primary and 'the rest' is adequate because I noticed that the examples collected seem to follow the recommendation made for posters regarding having few verbal components for efficient and quick message communication, as previously mentioned (Gardner, Luchtenberg, and Building 2000). Besides, the amount of text is likely to influence how children read the informational artefact. Too much text, especially for children who are learning to read, might be discouraging. In the materials studied here, the primary verbal information is similar to a headline and the second develops the subject matter.

Attracting attention to the artefact and introducing the topic, the sentence 'wash your hands' at the top of the poster shown in Figure 12 is an example of primary verbal information. This poster was produced by an independent company in the USA that develops resources for schools. The sentences below each picture in the poster in Figure 12 exemplify the secondary verbal information, which, in this case, describes the actions represented in the pictures.

Primary verbal information conspicuity

Similar to the pictorial information, the verbal information appears in different sizes across the H&S examples collected. However, the size of the verbal information could not be considered individually and is instead combined with other features to determine the verbal information conspicuity. Although the font size can influence children's reading (Hughes and Wilkins 2000; Walker and Reynolds 2003), the findings in this area are mostly in regard to continuous reading of textbooks or storybooks. Additionally, determining the size of the verbal information could not be done in an objective way, like the size of the pictorial information was determined, as the relation between the verbal information and other elements in the page influences its perceived size.

See, for example, the posters in Figure 13. The primary verbal information in the poster on the left (Figure 13a), which reads 'always cross where you can see what's coming', uses roughly one-fourth of that page. The primary verbal information of the poster on the right (Figure 13b), which says 'join the super smile team', uses more than half of the page. The portion of the poster in Figure 13a occupied by primary verbal information' (one-fourth) is rather small if compared with a half-page portion. However, when seen in relation to the other elements of the page – the secondary verbal information and the picture – it could

a

b

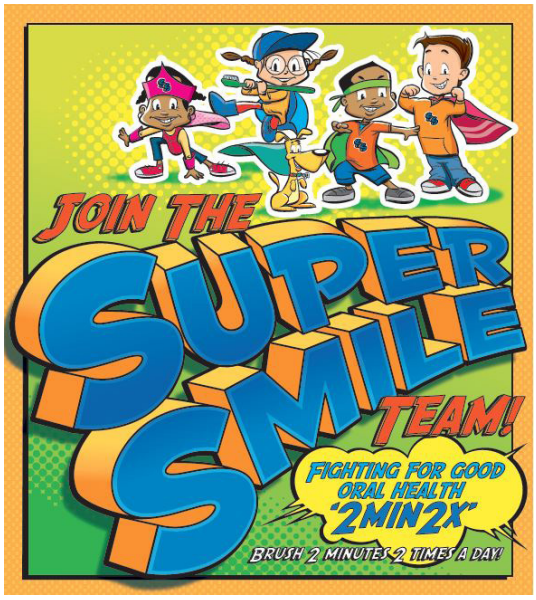


Figure 13: Comparison of primary verbal information in two posters that use different portions of each page: (a) large to medium-size primary verbal information in a road safety poster for the 'Tales of the Road' campaign, size A4, targeting 6- to 11-year-olds (source: Department for Transport, UK, 2009); (b) large area of primary information in a dental health poster, original size undetermined (proportionally in relation to its original size 15×17 cm), targeting children (no specific age range identified) (source: American Dental Association, USA, 2016).

be classified as medium or even large. Hence, the size of the verbal information could not be determined objectively.

For this research, the measured space occupied by the verbal information is less important than its ability to attract attention to the information. In this respect, there are guidelines for making words more noticeable for adults (Wogalter, Conzola, and Smith-Jackson 2002) and, in contrast to book reading, where recommendations are not the same for children and adults, signs for children seem to follow the same basic rules as those for adults (Rice 2013). Wogalter and colleagues (2002) suggest that verbal information in effective warnings should contain (1) a signal word, (2) identification of the hazard, (3) explanation of the consequences, and (4) instructions to avoid the hazard. Nonetheless, the examples of H&S information for children collected do not usually contain these four message components – perhaps because of the nature of the examples, which do not usually refer to an imminent hazard, but rather teach children how to act in possible future situations. Still, general guidelines used to make the wording conspicuous for adults seem to be followed for children in the sample gathered.

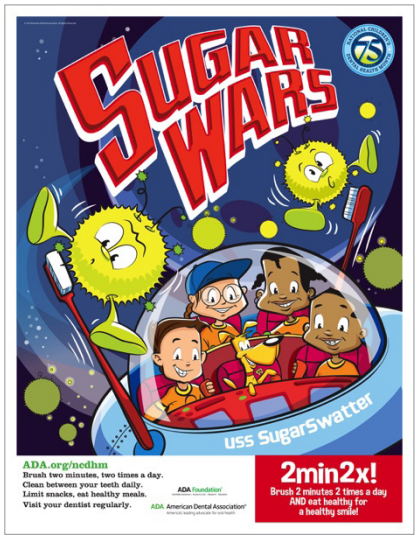
Bold typefaces, colours, and high contrast can make the information salient (Wogalter, Conzola, and Smith-Jackson 2002; Margolin 2013). Often formed of a sentence rather than a single word, the primary verbal information of the sample functions in a similar way to the signal word in hazard warnings. It usually carries the main information and has a larger typeface than the rest of the text, which helps to attract attention to the artefact. The secondary verbal information usually has a smaller typeface than the primary. Only the primary verbal information conspicuity is analysed in this research, as most of the secondary verbal information in the examples has less visual impact than the primary.

The conspicuity of the primary verbal information can be identified as *high*, *medium*, or *low*. In order to have high conspicuity, and therefore a high visual impact, the verbal information generally follows the guidelines mentioned earlier (i.e. bold typeface, colours, and high

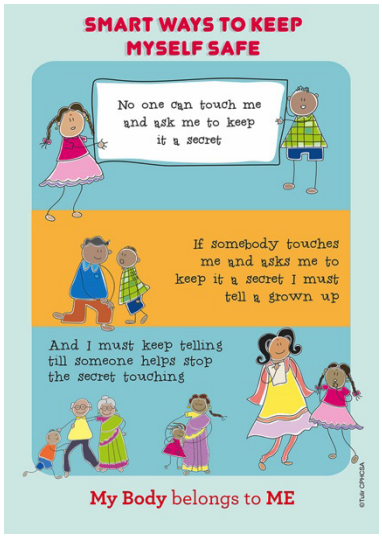
contrast), and its size in relation to the other elements in the page is also taken into account. Verbal information with medium conspicuity has fewer of these characteristics, and low conspicuity has even fewer and has a low visual impact.

The posters in Figure 14 have different verbal information conspicuity although all of them use the colour red and bold typefaces to attract attention; also, note that all posters are similar in size (i.e. either exact A4 size or nearly this size). The verbal information in the poster in Figure 14a uses a large proportion of the page, has a three-dimensional feature, and is well connected to the picture although it stands out. The other two posters have verbal information in smaller font sizes than the first one, but the poster in Figure 14b has a better contrast with the background than Figure 14c, and hence has medium conspicuity. Poster c's verbal information has a low contrast with the background, is somewhat mixed with the rest of the elements of the page, and therefore has low conspicuity.

a



b



c

Figure 14: Comparison of different primary verbal information conspicuity: (a) high verbal information conspicuity in a dental health poster, size 21.6×28 cm, targeting children (no specific age range identified) (source: American Dental Association, USA, 2016; (b) medium verbal information conspicuity in a child abuse prevention poster, size A4, targeting children (no specific age range identified) (source: Tulir, India, retrieved in 2017; (c) low verbal information conspicuity in a bike safety poster, size 23×35 cm, targeting 4- to 8-year-olds (source: I'm Safe, USA, retrieved in 2017).

Of course, this classification is estimated and somewhat subjective. To accurately determine the verbal information conspicuity, it should be tested with user, assessing how the different words used have an effect on how the information is perceived. For example, words such as 'danger', 'warning', and 'caution' are intended to differentiate levels of hazard and influence people's perception of the hazard they signal (Silver et al. 1993; Hellier et al. 2000; Wogalter, Conzola, and Smith-Jackson 2002). Nonetheless, the emphasis given to the verbal information, analysed here by assessing its probable conspicuity, contributes to determining the typical features of H&S information for children.

Colours

Both pictorial and verbal components of colours are analysed, which is different from how the categories discussed so far have been analysed. However, instead of looking at the colours for each of those components individually, the colours of the artefact as a whole are considered. The reason for this is that colours are physical features and thus they are perceived at the first glance; consequently, the most prominent colours are noticed first, and those are considered here. This

is also why the colours are classified as *colourful* or *sombre*. At this stage, the meaning of colours is not determined. Additionally, specific colours are not analysed since this is likely to be influenced by children's colour preferences, which are personal, conventional, and difficult to assess and are not the focus of this research. Moreover, studies about colours preferences among children (Child, Hansen, and Hornbeck 1968; Siu, Lam, and Wong 2015) are not conclusive.

Colourful examples are those in which the colours are salient either because of their variety or because of their brightness. Examples with sombre colours are those in which the colours are dull or dark. There is no distinction between families of colours used, such as primary colours or pastel colours, because of the great variety and combination of colours of the sample collected. Additionally, making a more granulated categorisation than colourful or sombre would imply too many combinations that would be more confusing than fruitful for the analysis of the material. Nonetheless, verifying the type of colours used in the corpus of H&S information gathered helps to understand how colours are used to attract children's attention and communicate specific messages, and this leads to the later identification of atmospheres at the content level.

Two examples of the possible types of colours are shown in Figure 15. The colourful internet safety poster, from Australia (Figure 15a), is part of a pack of five posters that relate to a game children can play online and a lesson plan for teachers. Although there is not a great variety of colours, the few vibrant colours that cover the whole poster make it colourful. A different approach is the poster from the Think! [8] campaign Tales of the Road (Figure 15b). Again, not many colours are used but they cover the whole poster. This time, however, the colours are dark and there is not much contrast between them, making this an example of the use of sombre colours.

a

b

8 Think! is a major road safety campaign run by the UK's Department for Transport, and it has several other segmented campaigns directed to adults, teenagers, and children covering different aspects of road safety. Currently different visual approaches of this campaign are in use, as it is possible to see in some examples used in this research, specifically the Tales of the Road campaign for children, which started in 2009 and is still running in 2018.

Figure 15: Examples of the two types of colour categories: (a) colourful internet safety poster, size A4, targeting 5- to 7-year-olds (source: Office of the Children's eSafety Commission, Australia, 2017); (b) sombre colours in a road safety poster from the campaign 'Tales of the Road', size A4, targeting 6- to 11-year-olds (source: Department for Transport, UK, 2009).

Integration of pictorial and verbal elements

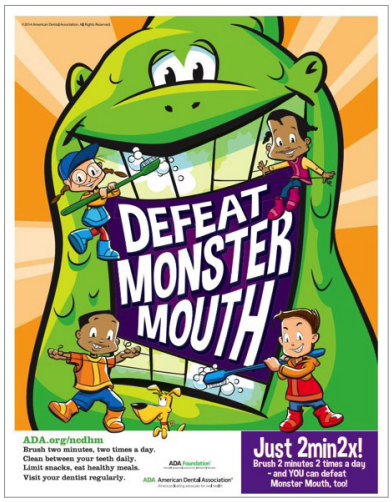
The position of pictorial and verbal elements in relation to each other determines how integrated they are, which is important as their integration might facilitate or obstruct 'reading' and consequently learning the information. Position and integration relate to two significant Gestalt laws: proximity and similarity. They both explain how we perceive separate visual elements as belonging to the same group (Pettersson 2017). The proximity law says things that are physically close together are perceived as being grouped. Consequently, pictorial and verbal elements that are near each other are perceived as intentionally connected, while the more distant they are from each other, the more dissociated they appear. Likewise, elements with physical similarities are likely to be perceived as a group (similarity law). So, pictorial and verbal elements that have the same visual treatment, such as the same colours and styles, seem to be connected.

Researchers recommend positioning pictures and verbal information together for better learning (Mayer and Gallini 1990; Peeck 1993; Mayer 2009), but note that these recommendations are usually made in regard to reading a considerable amount of text (e.g. scientific textbooks). In posters, contrary to in those kinds of texts, the picture plays a significant role that is sometimes equal to or more meaningful than the text, which is usually short. Hence, it is possible that when separation occurs, the impact on learning is different from that in large texts.

In short, the aim of this framework category is to determine how connected to each other pictorial and verbal elements are. To do this, only their visual characteristics (Gestalt law of similarity) and physical proximity (Gestalt law of proximity, and integration and separation methods) are considered; the subject matter within them is not considered. Three levels of integration of pictorial and verbal elements were defined: *unified*, *associated* with each other, and *dissociated* from each other. Unified pictorial and verbal elements are those in which the words seem to be part of the picture, almost as if they were drawn together; they are very physically close and similar in style. The dental health poster in Figure 16a is an example of unified pictorial and verbal elements. In this case, the primary verbal information is written inside the monster's mouth and is part of the picture – even though it is meant to be read.

Associated pictorial and verbal elements are those that are clearly related to each other but are less integrated than the unified category. They are either somewhat far from each other and visually quite similar, or close to each other with less visual similarity. Exemplifying this category, the poster in Figure 16b is from the Safe Kids Worldwide Organisation, which operates worldwide and offers both global and local graphic resources; this poster is an example from the UK. The blocks of text refer to the steps depicted in each picture, and therefore the picture and the text are associated because they are adjacent to each other but do not have any strong visual similarity such as colours, textures, or shapes. Hence, pictorial and verbal elements are associated.

a



b

c

Figure 16: Examples of the three types of integration of pictorial and verbal elements: (a) unified pictorial and verbal elements in a dental health poster, size 19x25 cm, targeting children (no specific age range identified) (source: American Dental Association, USA, 2016); (b) associated pictorial and verbal elements in a Helmet Fit Test poster, size A4, targeting children (no specific age range identified) (source: Safe Kids Worldwide, UK, 2013); (c) dissociated pictorial and verbal elements from a fire safety poster, size A4, targeting children (so specific age range identified) (source: NAFPA, USA, 2015).

Finally, dissociated pictorial and verbal elements are those that are so distant and/ or so physically different that it is difficult to see the connection between them except that they belong to the same artefact. They may or may not deal with the same topic. The poster in Figure 16c, previously shown in Figure 7, depicts a dog and children in the bottom right corner, both dissociated from the verbal information. The picture is not visually similar to the verbal information on its left and is somewhat distant from it. This particular picture, despite relating to the primary verbal information ('my fire inspection checklist'), does not add any relevant information to the checklist.

Summary of physical characteristics

All the aspects discussed in this chapter to analyse the physical characteristics of H&S information material for children are summarised in Figure 17. There are four pictorial categories, two verbal categories, and two that analyse the interaction between pictorial and verbal elements.

Figure 17: Categories of the framework's physical characteristics level. It contains four categories to analyse pictorial elements (type of picture, synoptic image or discrete elements, figurative picture size, size of combined illustrated area), two to analyse verbal elements (primary and secondary verbal information, primary verbal information conspicuity), and two to analyse the interaction between pictorial and verbal elements (colours, integration of pictorial and verbal elements).

Physical Characteristics	Pictorial	Verbal	Pictorial & Verbal
	Type *Drawings, Photographs, Drawings & photos*		
			Colours *Colourful, Sombre*
	Synoptic / Discrete *Synoptic images, Discrete elements*	**Primary & secondary verbal information** *Primary, Prim. + Sec.*	
	Size of figurative pictures *Small, Medium, Large*	**Primary verbal info. conspicuity** *High, Medium, Low*	
	Size of combined illustrated area *Small, Medium, Large*		**Integration of pictorial & verbal elements** *Unified, Associated, Dissociated*

3.3.2 Content level

More than making information noticeable, pictorial and verbal elements carry the content of the message communicated. For the viewers to understand the message, they first need to recognise the elements – pictorial and verbal – and then understand what they mean. For this recognition, the viewers need to be familiar with what is presented. For example, to recognise an object, they need to have previous knowledge of it (Mandler and Robinson 1978; W. H. Levie 1987; Spinillo 2000); to recognise words, they need to know the codes of the language used. As previously discussed, Goldsmith (1987) believes recognition is necessary and perhaps sufficient for comprehension of a whole picture. To understand its meaning, though, the viewers need to understand some implicit aspects of pictorial and verbal elements. In this respect, it should be considered that information is processed and filtered through people's attitudes and beliefs (Wogalter, Conzola, and Smith-Jackson 2002).

Bearing these observations in mind, the content level of the framework proposed here is composed of six categories which emerged from the corpus. They are: *main character, facial expression*, *pictorial information atmosphere*, *verbal information visual atmosphere, verbal information atmosphere,* and *verbal information valence*.

Main character

The character depicted in H&S information is significant for the communication with children. There is evidence suggesting that the character used to communicate messages may influence children's response to them. A study conducted by Roberto et al. (2010) showed that children preferred the taste of food whose packaging depicted trademarked characters (popular cartoons), rather than the same food without the cartoon characters on the packaging. Mizerski (1995) had also previously shown that trademarked cartoon characters caused children to recognise products and have a positive attitude towards them. Similarly, in research with adults, Molesworth, Seneviratne, and Burgess (2015) concluded that the use of celebrities who are 'attractive, believable, likeable and trustworthy' increased recall of information in safety messages. On the other hand, Neeley and Schumann (2004) found that animated characters that speak for a product can induce high levels of attention, character and product recognition, association, and character and product liking in children, but this appeared not to be transferred to high levels of product preference.

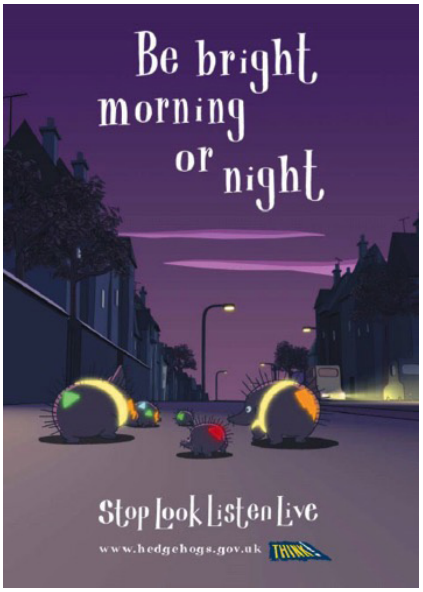


Figure 18: Example of animals (hedgehogs) as the main characters in a poster from a previous Think! Campaign, size A4, targeting 5- to 11-year-olds. Source: Department for Transport, UK, 2004.

Besides the research on products' marketing indicating the influence of famous characters on children's behaviour, the use of such figures in H&S information for children does not seem to be a regular practice. Some organisations do create and promote their own characters that might later become well known among children; yet, the use of existing famous characters is not often seen, possibly because of the financial cost. An illustrative example is the late 1990s campaign by the UK's Department for Transport featuring hedgehogs (Figure 18), which became well known and were used until 2007. Despite the recognition and popularity of the hedgehogs among children, a report that assessed this campaign demonstrated that older children (11- and 12-year-olds)

thought the hedgehogs were too 'childish' for them (ChildWise 2011). This campaign was then replaced by the 'Tales of the Road' campaign in 2008 (still running), which aims to reach children from a wider age range.

Figure 19: Sample of main characters in H&S information for children. Cuts from different resources as follows, from left to right: (a) child in a Helmet Fit Test poster (source: Safe Kids Worldwide, UK, 2013); (b) child with adult in a poster from the Think! Road safety campaign (source: Department for Transport, UK, 2009); (c) animal (dog) in a helmet safety poster, size A4, targeting children (no specific age range identified) (source: Safe Kids and Danger Rangers, USA, retrieved in 2017); (d) children and imaginary creature (alien) in a dental health poster (source: American Dental Association, USA, 2016); (e) objects (underwear) in a poster about child abuse prevention (source: NSPCC, UK, 2015).

a

b

Figure 20: Example of two facial expressions: (a) frightened facial expression in skin cancer prevention poster, size 22x25 cm, targeting primary and secondary school children (source: The National Council on Skin Cancer Prevention, USA, 2009); (b) happy facial expressions in children's safety poster, size A4, targeting children (no specific age range identified) (source: Safe Kids and Danger Rangers, USA, retrieved in 2017).

A general look at the sample collected showed that most of the characters represented in H&S campaigns for children are not previously known from other contexts. Additionally, there is no intention in this thesis of assessing whether the characters used are recognisable and familiar to children or not; the objective in identifying the character used in information for children is to determine visual tendencies in such materials. Thus, in the present framework, the main characters are classified as *children*, *adults*, *children and adults, animals or imaginary creatures*, *children and animals or imaginary creatures,* or *objects*. Figure 19 above shows a sample of these characters, which are the most common types depicted in H&S information for children.

Facial expressions

A well-known way of communicating mood and representing feelings is through facial expressions. Ekman's (2003) series of studies, conducted over 40 years, identified six universally recognised emotional expressions: anger, disgust, fearful, happiness, sadness, and surprise. He found similarities in the way people from different cultures he studied recognise and describe these facial expressions. In the material analysed for this research, not all of the expressions Ekman describes were identified, and additional expressions (such as curiosity) were considered worth analysing. The facial expressions identified for analysis in the H&S sample collected were *happy*, *fearful*, *curious,* and *other* (e.g. observant faces); and *n/a* (e.g. when there are only objects depicted).

The poster of a campaign called 'Don't Fry Day' that aims to prevent skin cancer, shown in Figure 20a, depicts a woman with a frightened facial expression – she is scared of being sunburnt. The frightened facial expression, in this case, is used for a comic purpose and to create awareness of the risks of being exposed to the sun, but does not aim to actually frighten the viewer. The example in Figure 20b is part of a series of posters from Safe Kids in partnership with 'The Danger Rangers' – characters from a television cartoon for children that teaches children about safety. This poster gives five warnings to children about chemicals, and both the photograph and the drawing depict happy facial expressions – although the topic presented is serious, the boy and the animals are smiling.

Pictorial information atmosphere

The pictorial atmosphere can set the tone of messages communicated in H&S artefacts. In this category of the framework, only the picture,

not the verbal information, is analysed. To determine the picture's atmosphere, it is necessary to look at its physical features and understand their implicit meanings. Colours, for instance, can be defined as warm (e.g. red) or cool (e.g. blue) (Arnheim 1974; Pettersson 2002; Kostelnick 2016), which attribute meaning to the artefact. According to Arnheim (1974), even though it is undeniable that colours carry strong expression, not much is known about how this happens. There is a belief that expression is based on associations which are conveyed according to cultural determinants. For instance, in some cultures 'red is said to be exciting because it reminds us of fire, blood, and revolution' (Arnheim 1974, 368), whereas 'blue is often used to represent truth and honesty. White is often associated with innocence and pureness, and black with evil and darkness' (Pettersson 2002, 130). Colours' associations would, consequently, be dependent on culture and an individual's experience. It is interesting to note that even young children understand this type of colour metaphor. Burkitt (2008) discusses diverse research that has shown children using the same colour metaphors adults use to depict emotions, such as darker colours for sad or frightening situations, and brighter colours for happy situations. Besides these effects, colours might also elicit emotional responses from people (Kostelnick 2016).

Illustrations also reveal a character's feelings through their facial expressions and body postures (Feathers and Arya 2012). The smile of a character probably indicates happiness, and if combined with cheerful colours these suggest a positive message. By considering all of the physical features, the picture's atmosphere can then be classified as *serious, neutral*, or *cheerful*. The need for a neutral classification comes from the fact that sometimes some physical features (e.g. colours) might suggest a cheerful situation whereas other elements (e.g. facial expressions) within the same document suggest a serious situation.

Figure 21: Examples of the three types of pictorial information atmosphere: (a) serious pictorial atmosphere in a road safety poster for the 'Tales of the Road' campaign, size A4, targeting 6- to 11-year-olds (source: Department for Transport, UK, 2009); (b) neutral pictorial atmosphere in a road safety campaign, size A4, targeting children (no specific age range identified) (source: Ministerio del Interior/ Direccion General de Tráfico, Spain, 2015); (c) cheerful pictorial atmosphere in a safe cycling poster, size 14x22 cm, targeting children (no specific age range identified) (source: Saskatchewan Prevention Institute, Canada, 2011).

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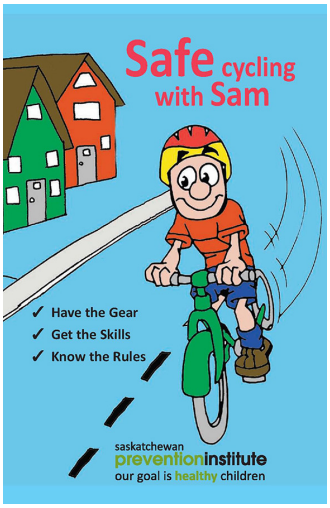


Posters from the 'Tales of the Road' campaign (Figure 15b – reproduced in Figure 21a) depict frightening situations. This atmosphere is perceived through the sombre colours and facial expressions. A different road safety approach is shown in the poster from Spain's Department for Transport (Figure 21b). This poster uses only pictures, with no verbal information, and depicts 'Los Bolechas', characters originally presented in storybooks. These children are demonstrating safe

practices on the road, have observant faces (classified as 'other' facial expressions), and are colourfully depicted; therefore the picture suggests a neutral atmosphere. A third approach is shown in Figure 21c, a poster from the Saskatchewan Prevention Institute (Canada). The cheerful atmosphere can be seen in the colourful poster which shows a happy child safely cycling.

Verbal information visual atmosphere

For this framework, visual attractiveness and atmosphere transmitted by the fonts are more relevant than its typeface aspects such as serif or sans serif, bold, or italic. Although the broader characteristics of typefaces could influence children's reading (Walker and Reynolds 2003), this is not the focus of this research. Unlike the picture atmosphere, the fonts were not classified as cheerful or serious, as the attributes that allow an objective classification into one of these categories are not present in the verbal information (e.g. fonts do not have facial expressions). Instead, the fonts are classified as *active* or *neutral*.

The meaning of the word 'active' when it is used in the framework in relation to fonts is that they have visual aspects that draw attention to them besides the meaning of the words they form. They do not usually transmit a static feeling, and sometimes these fonts might even look as though they are illustrations in parallel with being verbal elements. This thin borderline between verbal and pictorial in a font's visual aspects is exemplified in Figure 22a. This poster is part of a series of posters by the Consortium to Lower Obesity in Chicago Children (CLOCC) that explains the five rules of eating healthily and uses active fonts. The verbal information is written in an active, colourful font in a handwritten style that almost looks like a drawing.

Neutral fonts are essentially those not considered active. They are usually display fonts, with no 3D effects and no specific visual attractiveness that could interfere with or contribute to the pictorial elements. This is true of the poster in Figure 22b, by the University of Nebraska-Lincoln, that teaches situations in which children should wash their hands. Although the primary verbal information's font is blue, which contrasts well with the white background, it is also plain and flat and does not have many differentiating attributes that could be classified as active.

Similarly to the earlier category verbal information conspicuity, in this category only the primary verbal information's fonts are analysed. Individually, these fonts are often prominent on the poster or leaflet because of their position or font style or their relationship to the main illustration, and hence have more visual impact and attract more attention than the secondary information. Legibility and readability are not considered, but the visual aspects that might attract children's attention are.

Verbal information atmosphere

Besides the visual atmosphere transmitted by the verbal elements, the meaning of the words also indicates a particular atmosphere. The words

a

b

Figure 22: Example of two types of verbal information visual atmosphere: (a) active fonts in a healthy eating poster, size 30×45 cm, targeting 5- to 11-year-olds (source: CLOCC, USA, 2004); (b) neutral fonts in a poster about washing hands, size A4, targeting children (no specific age range identified) (source: UNL, USA, retrieved in 2017).

Figure 23: Example of a cheerful primary verbal information atmosphere in a child abuse flier, size A4, targeting 5- to 9-year-olds. Source: NSPCC, UK, 2015.

can reinforce the picture's atmosphere or counterbalance it, by making a frightening situation less so, for example. Using a less frightening approach in the verbal message can be useful to communicate a sensitive topic to children, as shown in Figure 23, for example. This leaflet by the National Society for the Prevention of Cruelty to Children (NSPCC) aims to prevent sexual abuse of children by using a hint of humour within a serious message, combined with a non-frightening picture. 'The underwear rule' is the leaflet's title; it contains an acronym, with the word PANTS describing the rules, and a few pairs of underwear are depicted. The text description for each letter has a serious tone, but the title uses humour to bring attention to the rules. 'Talk pants and you're covered' is an amusing way of saying 'talking nonsense' and plays with the fact that by wearing pants you 'cover your private parts'; the rules 'cover' unsafe situations.

The verbal information atmospheres identified in H&S information for children compose this category's variables: *cheerful* and *serious*. Verbal information that plays with the reader or is humorous is considered cheerful; those sentences that convey the information in a sober tone, with no playfulness or humour, are considered serious.

Verbal information valence

The verbal message usually tells children what to do or not to do and therefore has positive (i.e. affirmations) or negative (i.e. negations) valences. However, in the sample of H&S information for children collected, there is not necessarily only one or the other type of valence, and thus the types can be classified as *positive*, *negative*, a *combination of both*, *neutral* – that is, with no valence – and *n/a*. In this category both primary and secondary information are analysed.

Figure 24: Examples of verbal information valence: (a) affirmation in a Lego Fire Safety poster, size A4, targeting children (no specific age range identified) (source: NFPA, USA, 2013); (b) combination of affirmation and negation in a poster about safety near water, size 23×36 cm, targeting 4- to 8-year-olds (source: I'm Safe, USA, retrieved in 2017); (c) neutral message in a poster from the 5-4-3-2-1 Go! campaign to encourage healthy eating, size undetermined, targeting 5- to 11-year-olds (source: CLOCC, USA, retrieved in 2017).

a

b

c

The poster by the National Fire Protection Association (NFPA) depicting Lego characters (Figure 24a) gives fire safety tips for children in a list of affirmative sentences. Although this poster also has a negation, which is 'don't forget to make fire safety fun', this is not related to the actual instructions of the poster; hence the verbal information

valence is considered to be positive rather than both positive and negative. A combination of affirmation and negation is shown in Figure 24b, a poster about safety around water by the company 'I'm Safe', which produces H&S information resources. In this poster, the sentence 'walk, don't run' perfectly exemplifies both dos and don'ts at the same time. In turn, the poster by the Consortium to Lower Obesity in Chicago Children (CLOCC) in Figure 24c has neutral verbal information. This poster makes a list of what children should eat per day using a neutral, instructive approach. It does not directly instruct children to 'eat five servings of fruits and veggies', although this instruction is implicit in the poster.

Summarising content level

The categories used to analyse H&S information for children are summarised in Figure 25. There are three categories analysing pictorial elements, and three analysing verbal elements.

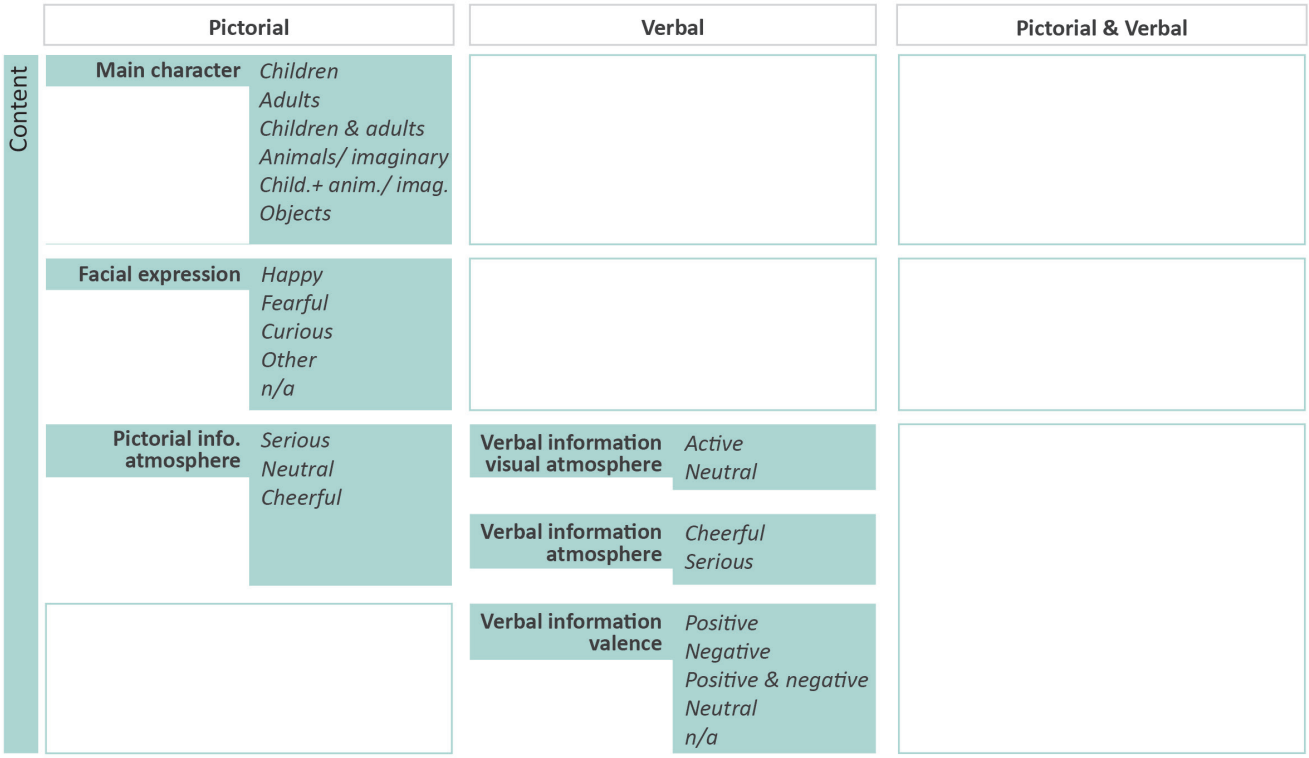


Figure 25: Categories of the framework's content level: three categories to analyse pictorial elements (main character, facial expression, pictorial information atmosphere) and three categories to analyse verbal elements (verbal information visual atmosphere, verbal information atmosphere, verbal information valence).

3.3.3 Purpose level

The physical features and content of an H&S artefact have a purpose, which is analysed at this level of the framework. Of the different aspects of purpose that could be taken into account, three are more pertinent to the analysis of H&S information for children proposed here. They are *behaviour depicted*, *verbal information intention*, and *pictorial and verbal information relationships*. Each aspect examines the main objective of each component (pictorial, verbal, pictorial and verbal) of the materials, and thus there are only three categories at this level of the framework.

Behaviour depicted in pictures (pictorial intention)

The sample collected shows that H&S information for children uses diverse picture strategies involving pictures to induce children to behave correctly. They often demonstrate *correct* or *incorrect* behaviours, showing

examples of what to do or not to do. Note that despite this category's name (i.e. *behaviour* depicted), pictures may also show *consequences* of the incorrect behaviour or *contextualise* a topic.

When showing correct or incorrect behaviours, the information is usually direct and explicit. Children are usually advised to behave in a certain way in a specific situation, but the material does not explain why that behaviour is the best approach or what would happen if they acted in an incorrect way. The poster from a campaign by the Saskatchewan Prevention Institute (Canada) in Figure 26a presents three rules for riding bikes and skating. Each rule has an accompanying picture that depicts the rule (i.e. correct behaviour). On the contrary, the page from a farm safety booklet in Figure 26b depicts the incorrect behaviour in a photograph, accompanied by a text that explains that children could be hurt or killed if they act in such a way. In this case, if the viewer sees only the picture they might not realise it is exemplifying the unwanted behaviour and think, for example, they should run so they are not hit by a farm vehicle.

a

b

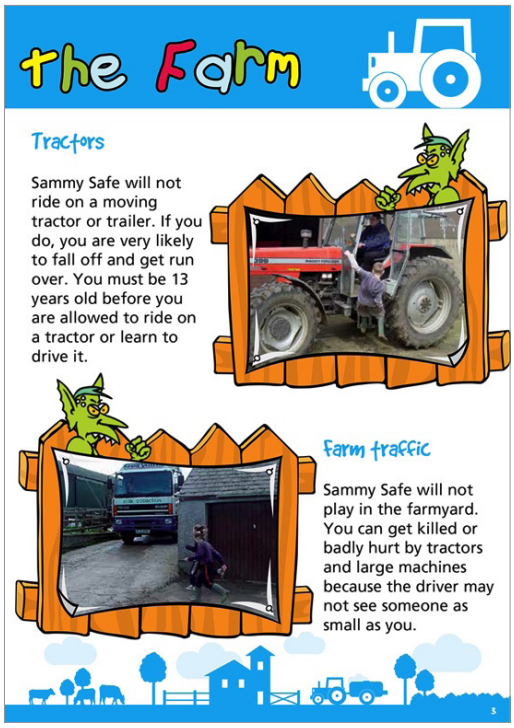
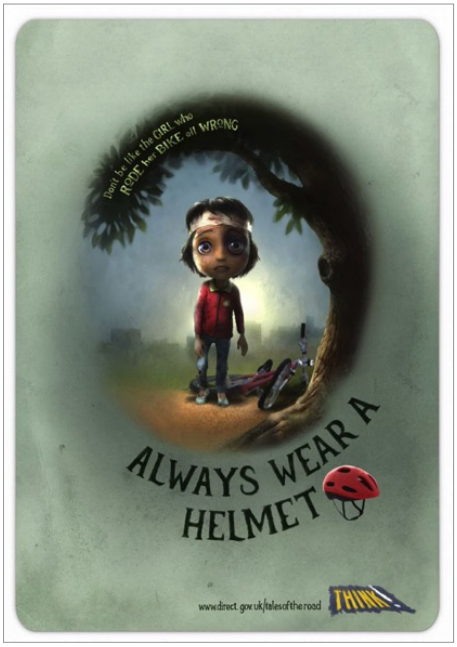


Figure 26: Examples of two types of behaviours depicted: (a) correct behaviour depicted in a road safety poster, 16×38 cm, targeting children (no specific age range identified) (source: Saskatchewan Prevention Institute, Canada, 2009); (b) incorrect behaviour on a farm safety booklet page, size A5, targeting primary school children (source: Health and Safety Executive for Northern Ireland (HSENI), UK, 2015).

Although showing consequences could be distressing, a study done with children to develop the new DfI's road safety campaign found that telling children about the consequences, and particularly showing the consequences, evoked consistently powerful responses (Firefish Qualitative Research 2008). Nonetheless, it is possible that not showing the actions that led to the consequences could also be problematic because children would need to fill in the gaps (actions leading to consequences) themselves.

The poster in Figure 27a exemplifies the depiction of consequences. In this poster, all the details necessary for children to construct all of the information are present: the incorrect behaviour leading to the consequences and the solution to prevent it from happening. The verbal information instructs the viewer not to be 'like

a



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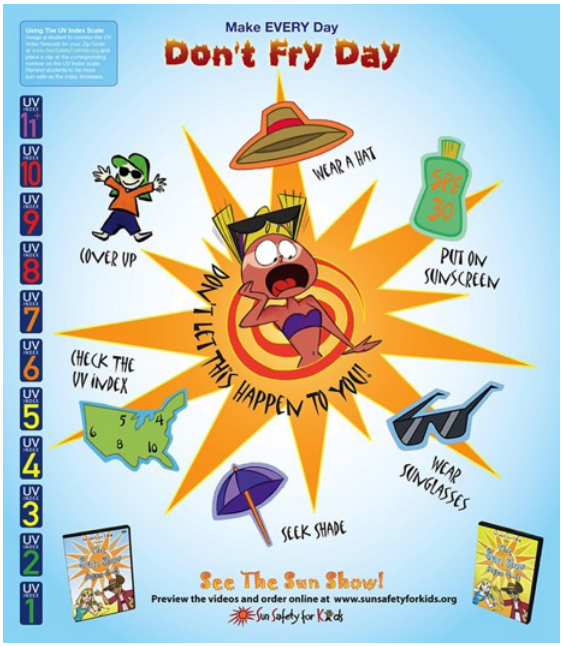

Figure 27: Two examples of posters showing the consequences of incorrect behaviour: (a) consequences of incorrect behaviour in a poster for the 'Tales of the Road' campaign, size A4, targeting 6- to 11-year-olds (source: Department for Transport, UK, 2000); (b) consequences of an incorrect action in a poster about skin cancer prevention that uses a humorous approach, size 22x25 cm, targeting primary and secondary school children (source: The National Council on Skin Cancer Prevention, USA, 2009).

the girl who rode the bike all wrong' (action: incorrect behaviour); the picture depicts a girl with an injured head, and there is a broken bike in the background (consequence). A second and bigger verbal element complements the information by telling children to always wear a helmet (solution: correct behaviour). Evidently, to understand the poster appropriately, children need to read the text and associate it with the picture, which also needs to be understood. The consequences of the incorrect behaviour can also be presented in a non-frightening way, like the case already presented and discussed in Figure 20a and reproduced here in Figure 27b. It is fair to notice, however, that consequences might also be misunderstood, as in the situation reported by Waterson and colleagues (2012), as described previously, which was that children thought the picture of someone trapped in a train seat was actually someone not being able to balance on the seat.

Figure 28: Example of a picture contextualising a topic. Flooding is depicted on the page for January of a calendar. Each month of the calendar shows a different risk; at the top of each page there is a picture showing the risky situation and at the bottom (not shown here) there are the days of the month. The calendar size is A3 (picture in A4 and month in A4) and it targets children (no specific age range identified). Source: The Developing Community Resilience Through Schools, UK, 2007.

Contextualising the topic in the H&S information is a way of introducing the issue being dealt with. The calendar page in Figure 28, by Essex County Council, shows a flooded town and problems caused by it – such as people asking for help, rescue teams collecting people's belongings – and raises some questions about how to be prepared for

this situation. Not many answers are given directly, but some of them can be discovered in the picture. In order to be fully understood, this type of artefact might require discussions about why flooding happens, how to be prepared for it, and what to do in this situation.

Verbal information intention

The verbal information intention refers to the communication purpose of the written message. The written information could *instruct* affirmatively or negatively (e.g. dos and don'ts) or *create awareness* (e.g. a safety checklist). In this framework, instructions are usually formed of steps that specify how to act in a particular situation, while awareness is created by presenting a situation or explaining a topic, for example. The verbal intention is, evidently, perceived through the words used.

The two examples in Figure 29 follow the same structure: pictures are associated with referent verbal information; however, the verbal information intention is different in each example. The first (Figure 29a), a poster by a parent teacher organisation from the USA, shows five steps for washing one's hands properly and the verbal information instructs through sentences such as 'run water over your hands'. The second (Figure 29b) is a poster from the Tulir Centre for the Prevention and Healing of Child Sexual Abuse in India that explains to children situations of which they should be aware in order to prevent abuse. In this case, although there are sentences that seem to give instructions, the verbal information creates awareness but does not indicate steps. For example, the second part of the sentence 'If you don't like how your body is being treated, *you have the right to say No, Stop, Don't*' could be understood as an instruction, but it says children *have the right* to say those words, and does this in a way that creates awareness of this option, which is how most of the rest of the poster works.

a

b

Figure 29: Examples of two types of verbal information intention: (a) instructive verbal information in a poster about washing hands, size 19×25 cm, targeting children (no specific age range identified) (source: PTO Today (parent teacher organisation), USA, 2010); (b) verbal information creating awareness in a child abuse prevention poster, size A2, targeting children (no specific age range identified) (source: Tulir, India, retrieved in 2017).

Pictorial and verbal information relationships

Researchers consider different hierarchies involving pictures and verbal elements when studying the relationships between them. Often pictures are seen as subordinated to the verbal information and sometimes both elements are considered to have the same importance, but rarely are pictures considered the main element of a page with a subordinated verbal message. Authors such as Fang (1996) and Norman (2010) describe pictures' functions as serving the text. Even though these authors acknowledge that sometimes pictures add extra information to the message, they are still seen as subordinated to the written message. This view is probably not the most useful when considering communication with children, which is extremely visual and in which pictures may have the same or even more impact than the words.

Authors such as Kong (2006) and Kress and van Leeuwen (2006) consider the existence of an interplay between pictorial and verbal information. In their view, one is not subordinated to the other; they construct the message together, even though sometimes one element can prevail over the other. Likewise, for Twyman (1985), recalling his model, discussed earlier (Figure 4 on page 20), pictorial and verbal elements are placed at the same level. To summarise, these three authors' approaches

do not prioritise one element over the other but show that according to the context one can be more appropriate than the other.

Using different approaches to the hierarchy of the different elements, researchers have described the different relationships between pictorial and verbal elements of children's books and documents in general. There is some overlap but also a lack of consistency in these descriptions, which the authors base on the information content of each part (pictorial and verbal). For instance, for Kong (2006) the term 'extending' indicates adding new information, while for Norman (2010) it means adding new information by specifying particular circumstances, which is called 'enhancing' by Kong. After grouping and simplifying similar terms from diverse studies (Fang 1996; Kong 2006; Norman 2010), I defined three terms that can be used to describe the relationships between pictorial and verbal information in H&S posters for children: *reinforcement*, *addition*, and *decoration*.

The first category is called reinforcement since each element (verbal and pictorial) reinforces the other; they both contain overlapping information and to some extent could replace one another. This is exemplified in the Educate 2 Empower Publishing material from Australia, a series of books and posters that teach children about personal empowerment. The poster in Figure 30a teaches children about body safety rules, and each verbal information block is accompanied by one picture that depicts one of the rules; in short, the picture and the text reinforce each other.

a

b

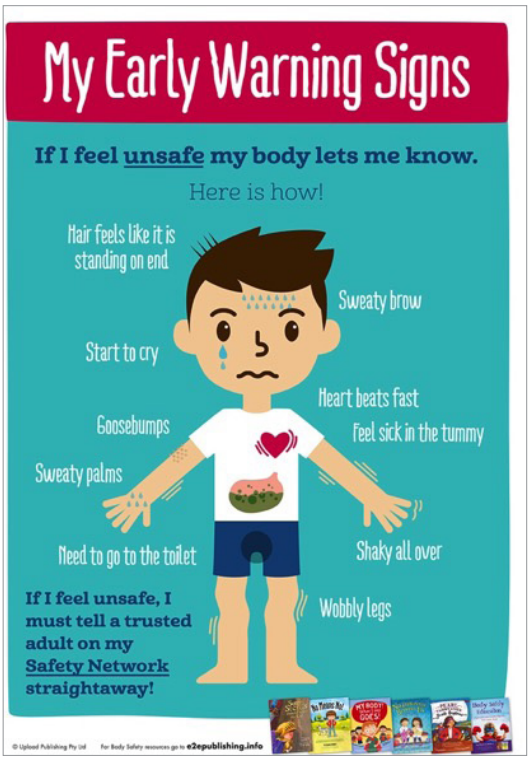

Figure 30: Examples of reinforcement and addition relationships between pictorial and verbal elements: (a) reinforcement relationship between the picture and the text in a child abuse poster, size A3, targeting children (no specific age range identified) (source: Educate 2 Empower Publishing, Australia, retrieved in 2017); (b) addition relationship between the picture and the text in a child abuse poster, size A3, targeting children (no specific age range identified) (source: Educate 2 Empower Publishing, Australia, retrieved in 2017).

The addition relationship describes pictorial and verbal information that relates to the same topic, but one or both of them have extra information that is added to the other. In H&S information such as the 'Tales of the Road' campaign shown previously (Figures 15b, 21a and 27a), the relationship between pictorial and verbal information is addition. In this case the picture adds information about

Figure 31: Example of a decorative relationship between pictorial and verbal elements in a fire safety poster, size A4, targeting 5- to 8-year-olds. Source: School Supplies, USA, retrieved in 2017.

the consequences, which, in turn, adds the action that leads to the consequences. Another example is the poster by Educate 2 Empower Publishing presented in Figure 30b that shows children the physical signs they may experience if they feel unsafe. Each written signal is also depicted in the drawing. Additionally, the blue text at the bottom left instructs children to talk to a trusted adult about the situation, which is not presented in the picture but is a crucial point of the poster. In other words, the text adds information that is not present in the drawing.

Finally, a decoration relationship refers to pictures that are used to attract attention but carry no relevant information; they might relate to verbal information but they might not. In the example in Figure 31, the company School Supplies, which produces resources for schools, uses decorative pictures to attract children's attention to a fire safety poster. The drawing of a fireman and the fire in the background relate to the topic, but not to the specific written advice. In other words, the picture does not add to or reinforce the information and is merely decorative. This type of picture can, however, be important for directing children's attention to the information. Evidently, decorative pictures carry some sort of information, as all visual elements do, but the key point is that this information is not relevant to the artefact's main message.

Summarising purpose level

The scheme that represents the categories of analysis of the message intention is depicted below in Figure 32. There is one specific category to analyse each of the artefacts components (pictorial, verbal, and pictorial and verbal interaction).

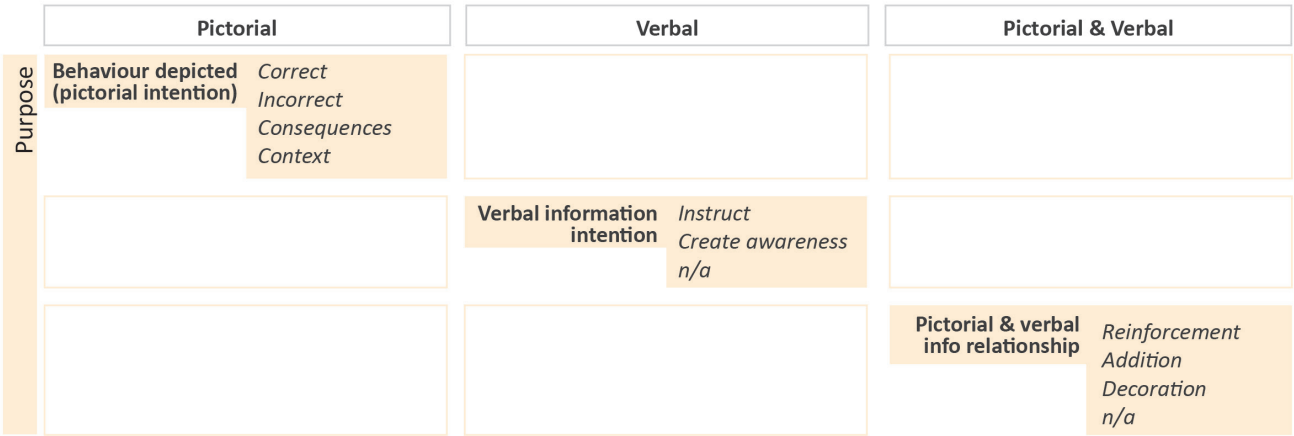

Figure 32: Categories of the framework's purpose level. There is one category to analyse pictorial elements (behaviour depicted), one category to analyse verbal elements (verbal information intention), and one category to analyse the interaction between verbal and pictorial elements (pictorial and verbal information relationship).

3.3.4 Section summary

In the framework developed (Figure 33), each example of H&S information for children from the sample selected is analysed by considering the three levels, i.e. physical features, content, and purpose, and the three main aspects, i.e. pictorial elements, verbal elements, and interaction of pictorial and verbal elements. Physical features are analysed with the aim of identifying the typical features that are first detected by the viewer, with no need for interpretation, including visual and structural aspects. In turn, the content level analysis helps to understand what meanings these physical features convey, what effects they intend to have on people, and what reactions they intend to

produce. The intention of these aspects and the reactions they create are considered at the purpose level, which looks at the objectives of the H&S information. The categories of this framework emerged from the sample of H&S materials collected and relevant theories, and the aim was to generate data pertinent for the objectives of this research. The following chapter discusses the trends that emanated from the analysis of the sample done using this framework.

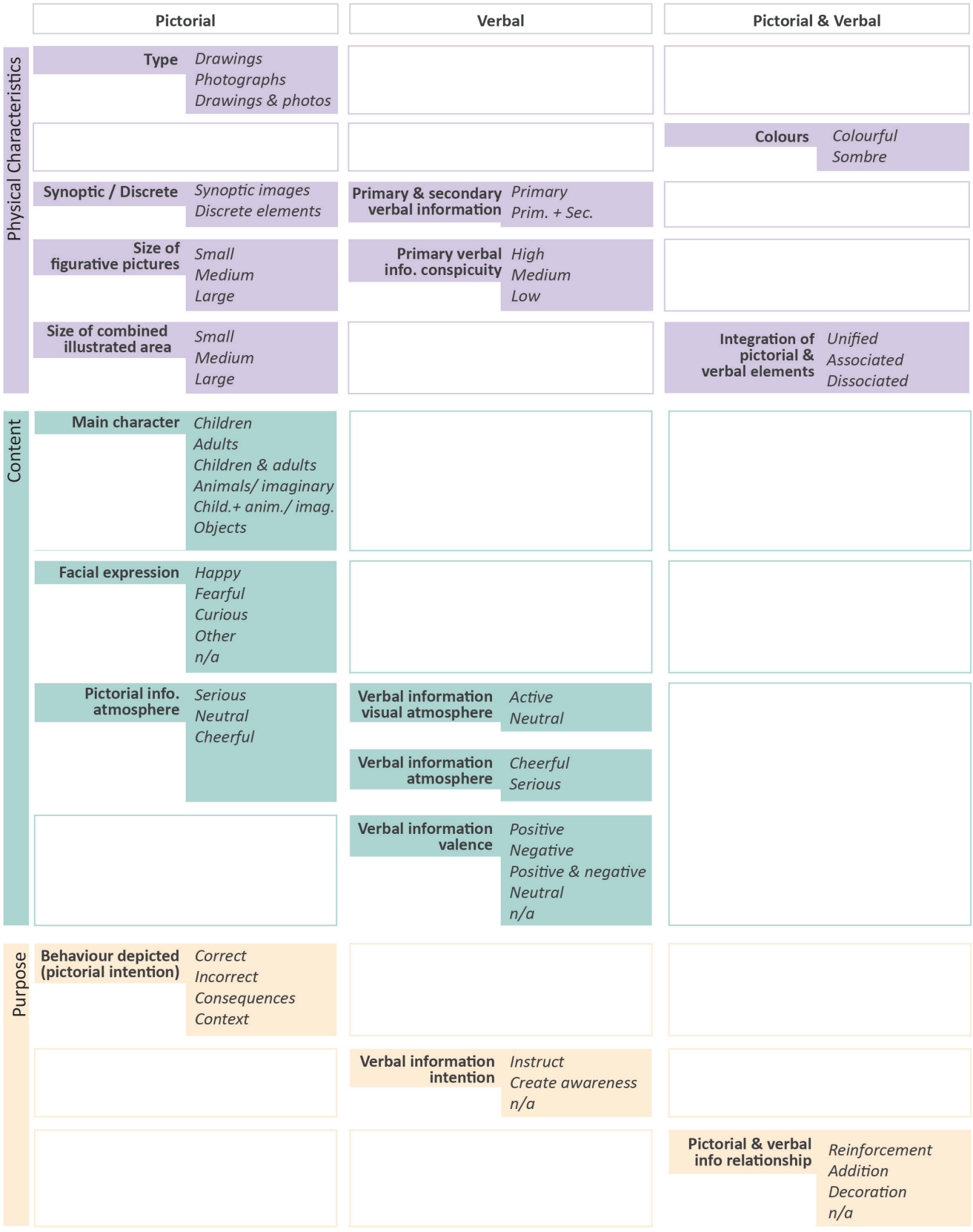

Figure 33: Framework with the categories of analysis of the three levels of analysis (physical characteristics, content, purpose) and the three types of components to be analysed (pictorial, verbal, and the interaction between pictorial and verbal elements).

Chapter 4 | Analysis of the H&S information sample

This chapter presents the analysis of the sample collected. Each level of the frameworks is discussed separately. At the end of the chapter the typical features identified are summarised and the most significant findings are highlighted. The analysis of the H&S information sample collected was made using the software FileMaker Pro, into which the framework described in the previous section was inserted. Before the analysis was done, the examples were catalogued using the same software; the details used were their name, the organisation responsible, country, topic, source (from where it was retrieved), date of collection, date of release, age range aimed at, and type of material. The date of release and age range aimed at were not always found. Each example received an identification number. The analysis was verified by a designer, researcher, and children's book illustrator, who made an independent analysis and corroborated the data I initially found. The results of the analysis are discussed next; initially, an overall view of the sample is presented, followed by discussions of the data from each framework level: physical features, content, and purpose levels.

4.1 Overall view of the H&S information sample collected

Sixty four examples of H&S information for children were collected digitally and physically. The sample consisted of 47 posters, six leaflets, seven booklets, and four examples that were not classified in any category but had a poster configuration. Although there were different types of documents, most of them followed the same structure: they had one or more pictures plus some verbal information. As mentioned in the previous chapter, the examples were collected mostly online and intended to reach 13 places (USA, UK, Australia, India, Portugal, Brazil, Spain, Canada, Germany, Iceland, Luxemburg, Europe, and a general global audience), as specified previously in Table 1 on page 8.

Table 3: H&S topics of the examples in the sample collected.

General Topic	n	Sub-Topics	n
Road safety	**10**		
Internet safety	**11**		
Child abuse	**12**		
General safety	**15**	General safety	4
		Fire safety	3
		Farm safety	2
		Summer safety	2
		Firework safety	1
		Bullying	1
		Trick or treat safety	1
		Ice safety	1
Health issues	**16**	Healthy habits	6
		Skin cancer prevention	3
		Healthy eating	2
		Dental health	2
		Health	2
		First aid	1

No remarkable differences were identified between the materials from different countries, suggesting a similarity in this type of communication with children across locations. Within the sample collected, the most common single topics were child abuse prevention (12 examples), internet safety (11), and road safety (10). Although health issues had the higher number of examples (16), they include artefacts that deal with several different topics, as does the general safety category. The frequency of the topics is shown in Table 3.

The age group targeted by each item was not always identifiable. Often they were described as resources 'for children' with no further specification, which was the case for 35 examples. Those examples which had accurate descriptors are shown in the graph in Figure 34. On five occasions the organisation that distributed the material said the information was for 'all ages of children' (examples 13 to 17 in the figure below); seven examples were for 5- to 11-year-olds; two were for children between 6 and 11 years of age; and the other two were for 7- to 12-year-olds. In the graph, the examples numbered 6 to 25 roughly target children from 6 to 12 years of age. This age distribution, plus the fact that 35 examples could, presumably, be used by children of any age, show that it is common to design H&S information for children from a wide age range.

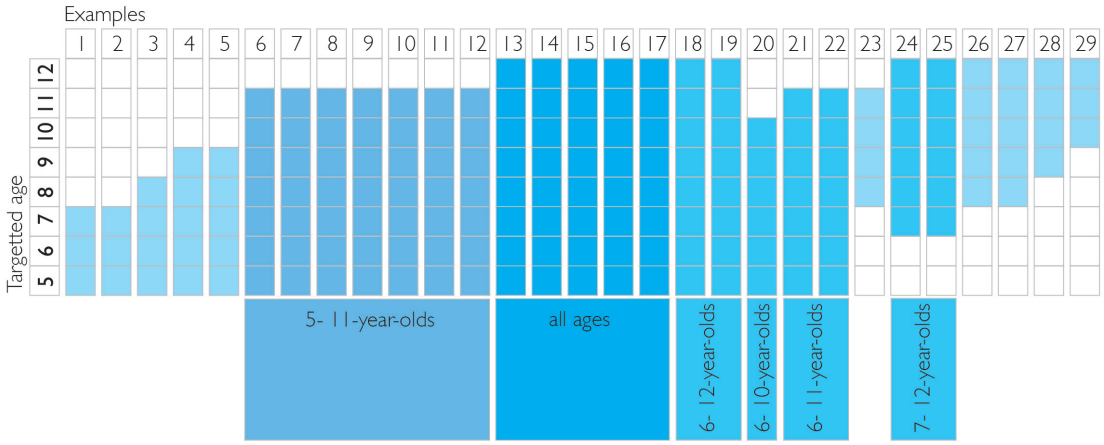

Figure 34: Twenty-nine examples collected for the sample to be analysed that specified their targeted age range. Each example in the horizontal axis was given a number, and its targeted age range is shown in the vertical axis. The ages shown range from 5 to 12 as they were the ages specified. The other 35 examples not shown in the graph did not specify the age range targeted, suggesting they were directed at all ages and could be added in this graph to the group in the middle – examples 13 to 17.

4.1.1 Analysis of the physical features of the H&S information sample

Two categories of analysis of the pictures' physical features are shown in Table 4. This table shows that drawings are significantly preferred over photographs as the type of pictorial information used in H&S materials for children. Only two examples used photographs and no drawings, one of which depicts teenagers even though it targets children of 7 years of age and older. Educational and psychology researchers discuss the role of pictures in comprehending accompanying texts (e.g. Peeck 1993; Faust 1995; Hannus and Hyönä 1999; Norman 2010) but do not determine the influence of the type of picture used. There is evidence that children prefer stories with drawings to stories without drawings, and those with colour drawings are liked the best (Levie and Lentz 1982). Maybe children's preference for drawings rather than photographs is a tacit knowledge or an assumption, not yet thoroughly documented, but there is clearly a convention that children prefer drawings. There is, however, a study from Ramsey (1989) which suggests that children

associate cartoon style with a pretend topic and photographs style with representing real life. Interestingly, somewhat contradicting the high frequency of drawings in children's resources, the results of this study – which evaluated children's preference for different art styles – indicated that photographs were preferred more often (52%) than cartoons (37%) among 1st, 2nd, and 3rd graders in a school in the USA.

Table 4: Results of the analysis of the physical features of pictorial elements, showing the categories type of picture, and synoptic image or discrete elements.

Physical features of pictorial elements			
Type of picture	**n**	**Synoptic image or discrete elements**	**n**
Drawing	58	Discrete	34
Drawing & photo	4	Synoptic	30
Photograph	2		

The pictorial information was fairly equally made up of synoptic images (30 occurrences) and discrete elements (34 occurrences). No major correlation was found with other categories from any of the framework levels that could indicate why one type is chosen rather than the other. The discrete images, however, were often used to depict pictorial procedure sequences, which is not a category of analysis in this framework but was noticed while looking at the corpus. Pictorial procedure sequences are a common and effective way of instructing users about sequences of actions (Spinillo 2000). Examples from the sample that demonstrated activities such as 'how to wash your hands' and 'how to fit a helmet' used discrete elements rather than a synoptic image. Nonetheless, not all discrete elements in the sample described a procedure.

Although no reference was found in the literature suggesting one or the other element (i.e. synoptic or discrete) is better for children's comprehension, Twyman (1985) says that discrete images could place considerable demands on the viewer due to the need to decode too many variables (e.g. conventions, drawing styles). However, the more familiar the viewer is with the presented variables, the more effective discrete images would be, as they can show different viewpoints of a scene or object, possibly overcoming synoptic images' efficiency. Twyman's approach relates, from a cognitive point of view, to the overload of cognitive capacity, which presumably makes the learning process problematic. This means that the more complex and unfamiliar the material and topic presented, the more cognitive capacity is required to process the information, as further discussed in Chapter 5. Synoptic images, in turn, present information via a single scene, which, depending on its complexity places more or less demands on the viewer than 'reading' a sequence of images.

Table 5: Results of the analysis of the physical features of pictorial elements, showing the categories figurative picture size, and size of combined illustrated area.

Physical Features of pictorial elements			
Figurative picture size	**n**	**Size of combined illustrated area**	**n**
Large	28	Large	50
Medium	21	Medium	10
Small	15	Small	3

The great importance of pictures that are aimed at communicating something to children is corroborated by the size of the figurative pictures and the size of the combined illustrated area in the H&S

information sample analysed, as shown in Table 5. The vast majority of the sample – 49 examples out of 64 – had either large or medium-size figurative pictures, large being the most common (28 instances). When the number of figurative pictures is added to the number of other shapes in the materials, the number of large illustrated areas is even higher: 50.

Most of the examples were composed of a combination of primary and secondary verbal information; this was seen 59 times. Primary verbal information usually has high conspicuity (33 examples) which helps to attract attention to the information by making it salient (Wogalter, Conzola, and Smith-Jackson 2002; Margolin 2013). Medium (17 examples) and low (14 examples) conspicuity also appeared, usually because there was little contrast between the verbal information and the background, and sometimes due to the existence of too many elements on the page, which made the verbal information look lost among them. The data for verbal physical features is summarised in Table 6.

Table 6: Results of the analysis of the verbal physical features, showing the categories primary and secondary verbal information and primary verbal information conspicuity.

Physical Features of verbal elements			
Primary & secondary verbal information	**n**	**Primary verbal information conspicuity**	**n**
Primary + secondary verbal info	59	High	33
Primary verbal info	5	Medium	17
		Low	14

At the first level of the framework, pictorial and verbal information were analysed together regarding their colours and position in relation to each other, and the results are shown in Table 7. The examples of H&S information for children analysed are almost exclusively colourful (61 examples) and usually use bright, vivid colours. Primary colours appear very often but the posters are not limited to them, and colours such as purple and green are commonly used in their vivid tones. Why such colours are used for children is not clear (see page 30, Colours subheading). It could be due to children's preference (Child, Hansen, and Hornbeck 1968; Siu, Lam, and Wong 2015), or to attract attention (Wogalter, Conzola, and Smith-Jackson 2002). Nonetheless, it is a fact that there is a convention that colourful artefacts are associated with children.

Table 7: Results of the analysis of pictorial plus verbal physical features, showing the two categories colours and integration of pictorial and verbal elements.

Physical Features of pictorial plus verbal elements			
Colours	**n**	**Integration of pictorial and verbal elements**	**n**
Colourful	61	Associated	48
Sombre	3	Unified	9
		Dissociated	7

The integration of pictorial and verbal elements might influence children's learning of the message (Mayer and Gallini 1990; Peeck 1993; Mayer 2009). It was found that most examples (48) in the sample had associated pictures and verbal elements, meaning that they were clearly referring to each other. The high number of associated pictorial and verbal elements suggests that H&S information is mostly designed in accordance with cognitive theories which suggest that spatial contiguity demands a lighter cognitive load. In other words, positioning

corresponding verbal and pictorial information near each other makes the message easier to process (Mayer 2009, 52), as further discussed in Chapter 5.

Nine examples had verbal information positioned as if it was part of the drawing, thus was considered to be unified with the picture. No research was found regarding aspects of reading this type of verbal information, such as whether it is difficult to read or whether it perhaps makes the words more attractive and interesting. On the other hand, seven artefacts were composed of verbal and pictorial information that seemed visually dissociated from each other, meaning that they were so distant and/or visually unrelated that without verifying their contents they could be seen as unrelated information.

Short summary of the analysis of the physical features level

Some clear tendencies of physical features of H&S information for children were found in the sample analysed. Drawings are the most common type of pictorial information, and they are composed of bright colours and use a large or medium-size area of the artefact. The pictures can be either synoptic or formed of discrete elements. The verbal elements comprise primary and secondary information, and the first usually has high or medium conspicuity. Pictorial and verbal information are most commonly positioned associated with each other.

4.1.2 Analysis of the content of the H&S information sample

H&S information for children tends to depict children as the main characters, as this was seen on 28 occasions (see Table 8). Animals and imaginary creatures are the second most recurrent characters, appearing 11 times; the occurrence of these and the other main characters depicted is shown in Table 8. There is no agreement in the literature on which type of main character is more efficient in communications with children. In a focus group with children (5- 10-year-olds) which was intended to develop train signs to develop train signs, Waterson and colleagues (2012) found that animals, rather than humans, were a popular children's choice to be depicted in signs. However, as an alternative to animals, in their study the sign they showed the children had a drawing depicting an adult rather than child. Perhaps if the researchers had shown a depiction of a child in the sign, the children would have preferred humans rather than animals. The UK's Department of Transport, for example, changed its campaign depicting a family of hedgehogs (previous Figure 18 on page 34) for the Tales of the Road campaign (previous Figure 13a, Figure 15b, Figure 27a) following an evaluation of the relevance and impact of the hedgehogs campaign (Firefish Qualitative Research 2008). The report of Firefish Qualitative Research (2008) found that the campaign was seen as too young for 6- to 11-year-olds and that depicting children would be more appropriate for that age range. Note that it is not known whether this finding is applicable across H&S subjects.

Happy facial expressions appeared more often (36 times) than other facial expressions in the sample analysed (see all in Table 8). Children supposedly recognise conventions that suggest that happy facial

expressions reinforce correct behaviours and that unhappy expressions reinforce the consequences of incorrect behaviour (Waterson et al. 2012). But besides the use of happy facial expressions to indicate a cheerful environment, smiling faces were also seen in posters about sensitive subjects such as child abuse. The reason for this could be to not frighten children and to treat the subject in the lightest way possible.

Table 8: Results of the analysis of the pictorial content, showing the categories main character, facial expression, and pictorial information atmosphere.

Pictorial Content					
Main character	**n**	**Facial expression**	**n**	**Pictorial information atmosphere**	**n**
Children	28	Happy	36	Cheerful	48
Animal/ Imaginary	11	N/A	11	Neutral	14
Children + adults	8	Other	8	Serious	10
Children + animal/ imaginary	7	Fearful	5		
Objects	8	Curious	4		
Adults	2				

The pictorial information atmosphere of the examples analysed reflected the characters' frequently happy facial expressions; i.e. the majority of the examples depicted a cheerful environment (48 examples), which is also related to the recurrent colourfulness of the materials.

As shown in Table 9, the verbal information visual atmosphere used was almost equally split into active (34) and neutral (30) fonts. If the pictorial information atmosphere depicted was mostly cheerful, the atmosphere of the verbal information was mostly serious (50). This could happen because the pictures communicate the message in a somewhat ludic way, involving the children with the subject; however, if the words also had a playful approach, the whole artefact could be seen as not serious. The verbal information valence, however, was usually positive, using dos (23) more often than don'ts (1). A negation was usually accompanied by some affirmations, i.e. a mix of dos and don'ts (14). Nonetheless, the most common verbal message was neutral, with no explicit dos or don'ts (24 times). The frequent use of affirmations was in line with the evidence that shows that people recall and respond better to affirmative instructions (Wright 1998; Margolin 2013) – even though this evidence relates to adults following instructions to perform tasks.

Table 9: Results of the analysis of the verbal content, showing the categories: verbal information visual atmosphere, verbal information atmosphere, and verbal information valence.

Verbal Content					
Verbal information visual atmosphere	**n**	**Verbal information atmosphere**	**n**	**Verbal information valence**	**n**
Active	34	Serious	50	Neutral	24
Neutral	30	Cheerful	11	Positive	23
		N/A	3	Positive & negative	14
				N/A	2
				Negative	1

Short summary of the analysis of the content level

Since the combination of pictorial and verbal was not analysed at the content level, patterns were found for each of these separately. Children are often depicted as the main characters, and they usually have happy facial expressions. Consequently, the atmosphere of the environment

depicted was usually cheerful and the verbal information visual atmosphere could be active or neutral. The atmosphere of the verbal information was mostly commonly neutral or serious, and the verbal information valence was either affirmative or neutral, but a combination of affirmations and negations was also frequently used.

4.1.3 Analysis of the purpose of the H&S information sample

The two elements (pictorial, verbal) and the combination of both elements were analysed by one category each at the purpose level. The pictorial purpose, frequently, was to contextualise the subject dealt with in the artefact, which was the case in 38 examples, as summarised in Table 10. The second most common pictorial purpose was to depict the correct behaviour (20 examples). Incorrect behaviour appeared only twice, possibly because portraying it could potentially encourage children to act in the way they are being asked to avoid (Waterson et al. 2012).

On the other hand, showing the consequences of incorrect behaviour could perhaps be better explored. For instance, showing the consequences of incorrect behaviour could help to understand the issue. Consequences appeared only four times in the sample and, as they do not show the incorrect behaviour but what could happen if a child acted in such a way, this seems unlikely to encourage inappropriate behaviours. The UK's Department for Transport currently uses the approach of showing consequences because of a report it commissioned which concluded that showing real consequences and delivering a powerful and emotional impact is more efficient than showing the correct behaviour in a cheerful environment (Firefish Qualitative Research 2008). As pointed out earlier, this tendency was found in material dealing with road safety education, and more research is needed for other subjects, as showing consequences in different areas could prompt a different impact on children.

Perhaps presenting all the information with examples of the correct behaviour allows children to receive the whole message immediately even though no consequences of incorrect behaviour are shown. On the other hand, maybe the approaches that require discussion and need some effort to elaborate on the original message could be more interesting than presenting the whole message, because children could construct the answers themselves, which fits with the research that shows that creating confusion in learning activities engages learners in cognitive flow generating better learning outcomes than with no confusion for complex information (D'Mello et al. 2014). Although no answer was found in the literature about which of these four approaches (correct behaviour, incorrect behaviour, consequences, contextualising subject) is the best one through which children can learn about H&S information, all of them are used in H&S information for children.

Table 10: Results of the analysis of the pictorial purpose, showing the results of the category behaviour depicted.

Pictorial Purpose	
Behaviour depicted (pictorial intention)	**n**
Context	38
Correct	20
Consequences	4
Incorrect	2

Although it seems plausible that in the artefacts in which pictures contextualise subjects the verbal information is likely to have the purpose of creating awareness, this correlation was not found. There was no consistent relation between pictorial and verbal purposes – when using the categories within the framework that guided the analysis. The most common verbal information intention was to instruct (33 examples), but a similar number of examples (29) intended to create awareness, as shown in Table 11. Two examples had no verbal information or were in languages [9] not identified.

9 The use of an machine translator to understand the verbal information in those materials was considered. However, some important aspects could be lost in translation potentially undermining the analysis as proposed here.

Verbal Purpose	
Verbal information intention	**n**
Instruct	33
Create awareness	29
N/A	2

Table 11: Results of the analysis of the verbal purpose, showing the results of the category verbal information intention.

Finally, the analysis of the relationship between pictorial and verbal information regarding their purpose showed that more than one-third of the examples have decorative pictures (24 examples), as shown in Table 12. Although the majority of the sample has pictures that include relevant information by reinforcing (28 examples) the message or adding (11 examples) information to the artefact, it seems surprising that so many pictures have no information that is relevant to the intended message, and these pictures perhaps function exclusively as attentional pictures, as defined by Levie and Lentz (1982). In artefacts of brief communication such as posters, which intend to transmit messages briefly in a limited space, it seems peculiar that this function is not accomplished by both the pictorial and the verbal elements within them.

Pictorial plus Verbal Purpose	
Relationship	**n**
Addition	11
Reinforcement	28
Decoration	24
N/A	1

Table 12: Results of the analysis of pictorial plus verbal purpose, showing the results of the category relationship.

Short summary of the analysis of the purpose level

The analysis showed that there were no single strong homogeneous features at the purpose level. Contextualising a subject in pictures was a common practice but so was exemplifying the correct behaviour. The verbal information usually instructed children what to do in specific situations, but the objective of creating awareness was also frequently found. Finally, reinforcing pictures was the most common pictorial purpose found; however, a surprising number of decorative pictures with no obvious relevant information were identified, indicating the need for further investigation of this aspect.

4.1.4 Typical features of H&S information

Typical features of H&S information were determined by analysing the sample of 64 examples of this type of artefact. Some trends corroborated expectations, such as the use of drawings and bright

colours; others were unpredicted, such as the large age range targeted by the examples, as well as the unexpectedly extensive use of decorative pictures. Interestingly, although trends were found, there were not many consistent correlations between the categories analysed. For instance, it was not found that affirmative verbal messages were mostly connected to a specific behaviour depicted or a particular subject. This was true for most categories except where some brief correlations (see decorative picture below) were found, which may not be of particular importance. To summarise, from each category analysed the following items were considered the most common typical features:

i) Pictorial information as drawings

ii) Synoptic or discrete pictures

iii) Large or medium-size figurative pictures

iv) Large combined illustrated area size

v) Formed of primary and secondary verbal information

vi) High or medium level of primary verbal information conspicuity

vii) Colourfulness

viii) Associated pictorial and verbal information

ix) Children as the main characters

x) Happy facial expressions

xi) Cheerful pictorial atmosphere

xii) Active or neutral verbal information visual atmosphere

xiii) Neutral or serious verbal information atmosphere

xiv) Affirmative or neutral verbal information valence

xv) Pictures contextualising a subject or depicting correct behaviour

xvi) Verbal information instructing or creating awareness

xvii) Pictures reinforcing verbal information, but also many decorative pictures

Although I call these features typical, the lack of consistency in some categories analysed suggested that the design of H&S information for children is done using a trial-and-error method. This is unlikely to be due to the negligence of designers or organisations, but may be due to a lack of research in this area, which requires the transposition of knowledge from other areas to designing H&S information for children. As already discussed, there is a vast amount of research about children learning from words and pictures in textbooks and the use of pictures in storybooks. These artefacts, however, are different from poster-like information in their physical characteristics, objectives, and way they are used, which means their design has its own requirements. Also, using guidelines regarding information design for adults when designing information for children might not be successful, as children perceive the world differently from adults and are not likely to know many visual conventions yet. Children's cognitive abilities should also be taken into account (see Chapter 5). In this regard, it was noticed that the children between 6 and 12 years of age are targeted with the same range of material regardless of their different cognitive developmental stage. It seems that a distinction is made between information for *children* and

teenagers, but none is made for the different developmental stages within each broad age group. This issue motivated further investigation, helping to define the age group of the studies in this research, and children's developmental stages are further discussed in the following chapter.

The other unexpected result of the analysis was the frequent use of decorative pictures. The only correlation found between this type of picture and the other categories was that they were usually used to contextualise subjects, for example by showing objects or situations related to the theme but not including any information relevant to the message communicated. Nonetheless, this correlation does not justify the choice of using a decorative picture, and it seems to be more of a consequence – the picture decorates, and thus provides some context – than a requirement. Additionally, not all contextual pictures were decorative. After the analysis had been done, it became clear that the pictures could be classified as informative and decorative, since the additive and reinforcing pictures contributed information to the artefacts, while the decorative pictures added no relevant information to them. Although collapsing the two (now called) informative categories resulted in a large group of 39 examples as opposed to 24 examples with decorative pictures, which, though comparable seems to be a less robust number, note that this still represents more than one-third of the sample in which pictures did not add relevant information to the instructional objective. Due to this surprising frequency, decorative pictures in H&S information for children were chosen for further investigation.

This chapter examined typical features of the H&S information corpus and identified that the physical features of the sample seem to be well established. The use of drawings, bright colours, large illustrated areas, conspicuous verbal information, and pictorial and verbal information associated with each other is virtually ubiquitous, and therefore seems to be working effectively in H&S information for children. Nonetheless, other categories did not have the same consistency and should be studied in depth in future research, such as the effectiveness of active or neutral fonts and the use of synoptic or discrete images. For this research, I decided to test the aspects that stood out as the most peculiar in the analysis: the use of informative pictures and the use of decorative pictures for an audience with a wide age range. Additionally, a picture depicting a comparison between incorrect behaviour and correct behaviour is also examined, bearing in mind the cognitive theories in the next chapter.

The next chapter investigates some aspects of children's development and also discusses cognitive theories relevant to children's understanding of H&S information, which lays the foundations for the studies in Chapters 6 and 7.

Chapter 5 | Cognitive and developmental factors

In this chapter I will examine the cognitive theories of information processing that may be relevant to children's understanding of H&S communications. I start with Mayer's (2005; 2009) cognitive theory of multimedia learning (CTML), which uses the term multimedia to describe instructional materials composed of words and pictures. Following this, the chapter looks at an expansion of the CTML developed by Moreno (2006; 2007; Moreno and Mayer 2007), who added the effect of affect and motivation in learning through words and pictures and called it the cognitive-affective theory of learning with media (CATLM). Other researchers also interested in the role of affect and motivation in learning studied the issue and are considered later when I discuss the possible effects of using decorative pictures in instructional material. Next, I highlight the relevance of these theories and research for H&S information for children, bearing in mind that H&S information is often treated as a school lesson in classrooms.

It is important to note that most of the studies done to develop the CTML, the CATLM, and other related research involved university students and did not consider the different stages of cognitive development of children. Since this thesis focuses on children aged between 7 and 11, which is when many cognitive developmental changes happen, this chapter concludes by discussing children's cognitive developmental stages and their possible effects on children's understanding of H&S information.

5.1 Cognitive theories and related research

The cognitive theories looked at in this chapter try to explain the cognitive processing of instructional materials composed of pictorial and verbal information. The analysis presented in the previous chapter showed that the sample of H&S information for children was formed, roughly, of two-thirds of materials using informative pictures and one-third of materials containing decorative pictures. As briefly discussed in Chapter 2, from a cognitive point of view, the frequent use of decorative pictures is surprising. There is evidence from research about reading instructional texts that using decorative pictures – also called seductive details – is detrimental to learning (e.g. Mayer, 2009). However, from the perspective of motivation and affect in learning, such pictures could have a beneficial effect (Schneider, Nebel and Rey, 2016).

Note that most research discussed next considers instructional materials with large amount of texts and some pictures, such as textbooks. No research was found regarding the cognitive processing of pictorial and verbal information in artefacts such as posters, which usually contain little verbal information combined with a large amount of pictorial information. However, as previously discussed (see Chapter 2), the lack of research on H&S information for children makes it necessary to transpose theories developed regarding similar materials (e.g. books, instructional materials, and publicity campaigns). Evidently, bearing in mind that H&S information has different compositions and objectives than textbooks, for example, studying different materials that

use different methods could result in apparent inconsistency of the results. For instance, Parks et al. (2011) noticed the relation between two specific results (seductive details as detrimental and not detrimental to learning) for two different types of materials studied (scientific texts and non-scientific texts), as discussed further in this chapter.

5.1.1 Cognitive theory of multimedia learning (CTML)

The central cognitive theory considered here is Mayer's (2009) cognitive theory of multimedia learning (CTML). The main supposition of this theory is that people learn better from picture and words than from words alone. Mayer explores three assumptions that underlie his theory, dual-channel, limited capacity, and active learning. According to the dual-channel hypothesis, humans have separate channels for processing pictorial and verbal [10] information. The limited capacity theory assumes that humans have a limited information processing capacity, which is a significant point for the issues raised in this thesis (i.e. the use of decorative pictures), as discussed throughout this chapter. Finally, the active processing assumption states that humans learn when they are cognitively active.

10 When discussing the dual-channel theory, Mayer also considers the difference between the presentation of auditory and visual information, but for the purpose of this research I only consider the different aspects of the visual mode (pictorial and verbal). For more on Mayer's understanding of the dual-channel theory and the differences between presentation modes and sensory modalities, see Mayer (2009, 65).

Processing information, according to Mayer (2005, 2009), occurs in five steps: (i) selecting relevant information from words and (ii) pictures; organising the selected (iii) words and (iv) pictures into coherent mental representations, words into a verbal model and pictures into the second into a spatial representation; (v) integrating spatial and verbal representations and previous knowledge. In this scenario, due to the limited cognitive capacity, the selection of words and pictures is not arbitrary; the learner determines which words and pictures are most relevant since she/he cannot remember everything. The limited capacity also indicates that organising the information in simple rather than complex structures is necessary, as humans are not able to build all the possible connections between new and previous knowledge. Meaningful learning occurs when the learner has good retention of the information and good knowledge transfer (i.e. is able to apply the new knowledge to different situations). On the other hand, fragmented learning happens when there is good retention and poor knowledge transfer (Mayer 2005; Mayer 2009).

In relation to the cognitive load (which has limited capacity), learners can engage in three cognitive processes during learning (Moreno and Mayer 2007; Mayer 2009): extraneous, essential, and generative. Extraneous processing is the cognitive processing that is not necessary for learning, such as looking for a picture that is not near its related text or observing a picture that does not include information that is relevant to the learning outcome. Essential processing is required to select which new information is represented in a person's working memory, and hence the more complex and unfamiliar the material the greater the level of essential processing needed. Finally, generative processing happens when making sense of the new information, organising it, and integrating it with prior knowledge. According to the CTML, the occurrence of extraneous processing might overload the cognitive capacity, disrupting the learning process, as there would be little remaining cognitive capacity

for essential or generative processing, which are both important for learning. Mayer says that a confusing instructional design is often the cause of extraneous processing, as are pictures that do not serve the learning outcome, which Mayer calls 'attention grabbing extraneous material' (Mayer 2009).

Mayer (2005; 2009) suggests 12 multimedia design principles[11] that should be adopted to increase meaningful learning: coherence, signalling, redundancy, spatial contiguity, temporal contiguity, segmenting, pre-training, modality, multimedia, personalisation, voice, and image; four of them are especially relevant to the present thesis. The coherence principle, for instance, says that people learn better when extraneous material is excluded rather than included (Mayer 2009). However, as seen in the previous chapter, a large amount of H&S information for children includes decorative pictures that are not relevant to the message communicated.

11 For a full description see Mayer (2005, 63; 2009, 52, 53).

The signalling principle in Mayer's multimedia design principles list recommends highlighting essential information (Mayer 2009). In the sample analysed, essential information was often found to be highlighted in some way, as demonstrated by the number artefacts containing primary verbal information that was conspicuous to a high or medium level (31 high and 19 medium – out of 64 examples). Spatial contiguity, another CTML principle, was also frequently found in the sample analysed. It refers to placing related verbal and pictorial information near each other, and it was evident in the sample in the number of associated verbal and pictorial elements (found in 48 out of 64 examples). Last but not least, Mayer's 'multimedia' principle is the main assumption of the CTML, which says that people learn better from words and pictures than from words alone, which is the combination used in the vast majority of the H&S information corpus.

As observed, three principles – multimedia, signalling, and spatial contiguity – are recurrent features of the H&S information sampled, but there are a few exceptions. If these three principles are present, they help to reduce the cognitive load, therefore fostering learning. Contradictorily, however, one-third of the examples analysed included decorative pictures, which are believed to create extraneous overload processing, according to the coherence principle.

Mayer and colleagues believe that seductive details are harmful to learning because of the results of tests they conducted (Mayer 2005; Sung and Mayer 2012; Mayer and Fiorella 2014). Nonetheless, Mayer also acknowledges that some seductive details could be added to pictorial information in order to foster learning, but only if these details highlight relevant information and so reinforce the signalling principle rather than contradict the coherence principle. This was further demonstrated in Mayer and Estrella's (2014) study that replicated earlier work by Um et al. (2012) and Plass and colleagues (2014). In these three studies, human facial expressions were included in a biology lesson to exemplify a 'good' cell (neutral face) and a 'bad' virus (angry face), as discussed in more detail later. As a result, the students who received the anthropomorphised pictures outperformed the control group in learning

tests. The authors, however, interpret the results somewhat differently. Um et al. (2012) and Plass et al. (2014) attribute the better results to motivation through the generation of positive emotions; Mayer and Estrella acknowledge the possible role of motivation in such results, but stress that there is no evidence to explain what the mechanisms are through which such highlighted details enhanced learning. Finally, Mayer and Estrella correlate the results with the cognitive-affective theory of learning with media (CATLM), which is an attempt to find such answers and is discussed next.

5.1.2 Cognitive-affective theory of learning with media (CATLM)

Expanding Mayer's CTML by integrating affect and motivation in learning, Moreno (2006; 2007; Moreno and Mayer 2007) proposed the cognitive-affective theory of learning with media (CATLM). With this theory, Moreno tries to answer the question of what supports the cognitive processes described in the CTML (i.e. select, organise, and integrate) – in tune with Mayer and Estrella's (2014) study presented above. Moreno and Mayer (2007, 310) say that 'motivational factors mediate learning by increasing or decreasing cognitive engagement' and that 'metacognitive factors mediate learning by regulating cognitive processing and affect'. One of the assumptions of this theory is that affective features of a multimedia material can influence the learner's cognitive processing. Three approaches to trying to increase the learner's motivation are described in Table 13 below.

Table 13: Three approaches to instructional design. Adapted from Mayer (2014a, 172).

Approach	Description	Example
Less is more	Use design features that minimise extraneous processing and manage essential processing	Delete extraneous illustrations and text or highlight essential material
More is more	Use design features that motivate learners to engage in generative processing	Add appealing graphics or challenging learning situations
Focused more is more	Use design features that motivate learners to engage in generative processing while also providing enough guidance to mitigate excessive extraneous processing	Add appealing graphics that are relevant to the instructional objective; include challenging learning situations but provide sufficient time and guidance to attain the learning objective

According to the guidelines in the table above, it is possible to incorporate motivational features in instructional materials, such as appealing graphics, provided that they enhance essential information and do not act exclusively as seductive details. Extraneous material, or seductive details, in turn, would still need to be eliminated, though. These design approaches intend to reduce extraneous overload and foster generative processing, as shown in the results of the three studies cited earlier (Um et al. 2012; Mayer and Estrella 2014; Plass et al. 2014).

The CATLM suggests using appealing graphics in specific circumstances. The design of current H&S information for children does not seem to reflect this suggestion, given the elevated number of pictures found in the sample analysed (see previous chapter) that do not conform to the CATLM recommendations. The decorative pictures found across the sample often do not enhance relevant information,

but rather add seductive details to the material, attributing to the verbal elements the role of carrying any significant information to achieve the instructional goal. It seems unlikely, although possible, that H&S materials containing decorative pictures would be so frequently produced if they were ineffective due to the pictures' negative effects. While there is consistent research showing that seductive details are detrimental to learning, as already discussed, there is also research showing that seductive features are not always harmful. Both views are discussed next.

5.1.3 Possible effects of the use of decorative pictures in instructional materials

Whether pictures were classified as informative or decorative was decided with reference to the relationship between pictorial and verbal information used in the framework, as discussed in Chapter 3. If the classification were to be done from a cognitive point of view, however, it may be slightly different. Sung and Mayer (2012), for instance, split decorative pictures into decorative and seductive ones. For them, the first have a low level of relevance and interestingness; the second are highly interesting but have a low level of relevance to the instructional goal. In their classification, informative pictures include information that is relevant to achieving the learning objective, have a high level of relevance, and may have either a low or a high level of interestingness. Sung and Mayer's study showed that seductive pictures were harmful to learning, although they increased the positive effect; decorative pictures were neutral, achieving the same results as words alone; and the instructional pictures fostered learning. They also identified that satisfaction ratings were higher for materials with any kinds of pictures than for materials with no pictures.

On the other hand, other researchers believe that affect and motivation have a bigger role in fostering learning from a cognitive point of view than Sung and Mayer (2012) proposed. Schneider, Nebel and Grey (2016) distinguish pictures as informative or decorative. Although these authors' classifications of pictures are similar to those in the framework in this thesis, they subdivide decorative pictures into seductive and conducive ones, which can have metacognitive or emotional effects on the viewer. They say that seductive decorative pictures are those interesting but irrelevant pictures that have often been found to be detrimental to learning, which is similar to Sung and Mayer's definition of seductive pictures. However, Schneider, Nebel and Grey (2016) include (meta)cognitive conducive decorative pictures that are 'supposed to enhance learning mediating processes like cognition and metacognition' and can also support retrieval and function as retrieval cues that are linked to verbal information (Schneider, Nebel, and Rey 2016, 66).

As already mentioned, the present research does not distinguish decorative pictures from seductive details, although both of these terms are used in this chapter. The term 'seductive details' was first used by Garner, Gillingham and White (1989) to refer to words that add interestingness to the text but are irrelevant to the learning objective, and this was later expanded to incorporate pictures as well. Note that

the research base for this chapter considers both words and pictures as seductive details, often studying both under the same circumstances. Nonetheless, there is evidence that words and pictures have distinct effects on learning. In an eye-tracking study, Rey (21014) compared the time spent looking at seductive pictures and seductive text, finding that learners spent more time looking at seductive text passages than seductive illustrations. He suggested that the learners could presumably recognise faster that the seductive pictures were not relevant, while the seductive texts contained a larger amount of information than the pictures and were embedded in relevant text, and thus the learners required more time to discard them. Therefore, in the studies described next I have given more emphasis to the pictorial seductive details, i.e. the decorative pictures.

Three possible roles of seductive details/decorative pictures extracted from previous research are as follows:

a) Seductive details/decorative pictures have no influence on learning

b) Seductive details/decorative pictures harm learning

c) Seductive details/decorative pictures foster learning

(a) Seductive details/decorative pictures have no influence on learning

Most of the research accessed demonstrated beneficial or detrimental effects of seductive details; few studies, though, found them to be neutral to learning. In the study cited above, Sung and Mayer (2012) found that decorative pictures can be neutral, causing no harm, but also not fostering learning. Note, however, that these authors distinguish seductive details from decorative pictures, and this result refers to the latter.

(b) Seductive details/decorative pictures harm learning

As already discussed, Mayer CTML (2005, 2009) considers seductive details to be detrimental to learning as they are extraneous material which creates extraneous cognitive overload, therefore harming learning. Mayer is not alone in this view; on the contrary, many other researchers have already expressed the same concerns (see Chapter 2). According to this view, seductive details in multimedia instructional material is likely to grab learners' attention, overloading their cognitive capacity and leaving them with little capacity to process the relevant information of the lesson. Hence, material that is complex or that has a confusing design that does not follow the principles of the CTML cited earlier will increase learners' cognitive load, disrupting the processing of the relevant information. This issue is known to be worse for students with low prior knowledge and students who are less able learners (Moreno and Mayer 2007; Mayer 2009;), who, consequently, are less able to suppress irrelevant information (Pike, Barnes, and Barron 2010). 'High prior knowledge learners would be able to chunk information elements into larger units and may already have automated certain processes reducing their working memory load' (Magner et al. 2014, 142).

Despite the consistent research demonstrating the harm that seductive details do to learning, they are frequently used in instructional materials – and perhaps this is one of the reasons for the existent

interest in researching this area. Still, if the detrimental effects are so evident, questioning why designers keep producing such materials is relevant. It might be that designers develop materials in accordance with their conception of how the human mind works, as suggested by Mayer, who explains that

> *when a multimedia presentation consists of a screen overflowing with multi-coloured words and images – flashing and moving about – this reflects the designer's conception of human learning. The designer's underlying conception is that human learner possesses a single-channel, unlimited-capacity, passive-processing system. (Mayer 2009, 63)*

Although the human mind does not work in such terms, as previously said, people report a positive affect when they see images (even if they are disruptive) in instructional materials (Sung and Mayer 2012), which links to the following section.

(c) Seductive details/decorative pictures foster learning

The main argument of those investigating seductive details who believe they are beneficial for learning is that they may increase learners' motivation, which encourages the persistence of learning. Schnotz, Fires and Horz (2009) argue that motivation is essential for learning and that reducing all the extraneous elements of instructional material, as proposed by the CTML, could result in a lesson that is not sufficiently interesting to catch the learner's interest. Additionally, they say that reducing extraneous details excessively could result in materials being used that are no longer optimally activating from a motivational perspective.

With the aim of trying to explain how seductive details might be beneficial for learning, some researchers have investigated the role of emotions in learning. Nonetheless, although emotions do seem to affect people's engagement or disengagement in certain campaigns, as briefly pointed out in Chapter 2 (section called Affective response to pictures), the role of those emotions in learning – if any – is not yet clear. The evidence supporting the notion that positive and negative emotions affect learning in instructional design is not very consistent, perhaps due to the different methods used in each study, or because of the various types of subjects, materials, and pictures tested in them. As previously pointed out, H&S information for children is partially similar to instructional materials and to the material used in campaigns – which seem to be affected by personal identification with the theme (Houts et al. 2006) and/or a personal reaction to it (Joffe 2008).

In an attempt to prove that influencing the learner's feelings through pictures could foster learning, Magner and colleagues (2014) tested the hypothesis that decorative pictures could create situational interest and maintain it in order to generate individual interest, which would result in engaged learning. To do this, the pictures used would have to be entertaining, providing positive feelings (i.e. feeling-related) in the learner, and should evolve to make the subject valuable to the learner (i.e. value-related interest) by connecting it to his or her expectations and goals. Engaging the learner in the task would increase comprehension

and recall, and could be responsible for further learning. Magner et al.'s study showed that decorative pictures triggered the first part of the process, meaning they could create situational interest in high prior knowledge learners and benefit them. The situational interest, however, did not seem to be maintained and did not evolve to create a value-related interest, for which the authors were seeking.

Focusing on triggering emotions through pictures, Schneider, Nebel and Grey (2016) define the 'conducive decorative pictures' mentioned earlier in this chapter. This type of picture would evoke emotional and/or motivational states, and they are produced to catch the viewer's attention. Schneider and colleagues, intending to manipulate students' emotions by showing them decorative pictures depicting people with happy or worried facial expressions and body postures, conducted a study in which positively valenced pictures led to a greater sense of pleasure and fostered knowledge retention and transfer performance. They concluded that some decorative pictures can induce emotional states that enhance learning performance, or at least are not detrimental to learning and have the same learning outcomes that verbal-only conditions have.

As discussed in Chapter 2, creating positive emotions through pictures was also investigated by Um and Plass and their colleagues (2012; 2014). Based on the results of their first study (Um et al. 2012), they suggested that positive emotions facilitated cognitive processes and learning in both recall and transfer tests. Replicating this study a couple of years later with a different population (Plass et al. 2014), their results suggested that positive emotions induced by the materials facilitated comprehension but that transfer performance was not affected. These two studies suggested the improvement in learning happened because of the positive emotions triggered by the material, a result that was not perceived in a third replication of the study done by Mayer and Estrella (2014). Although in this last study there was also an improvement in learning results, the self-reported emotion did not differ from that of the control group, so there was no evidence of higher affective ratings. Hence, Mayer and Estrella argue that appealing graphics engage the learner in appropriate cognitive processing during learning (CATLM principles, Table 13), which explains the better performance of the group that received highlighted (relevant) graphics, which the authors had not classified as seductive details.

Schnotz, Fries and Horz (2009), who do not specifically focus on emotions but who consider the topic from a motivational perspective, as mentioned at the beginning of this section, believe that the cognitive load theory, in which the CATLM and the CTML are partially based, oversimplifies the idea of reducing the extraneous load to foster learning processes. One of the issues they point out is the fact that in a low cognitive load the free resources available are not necessarily used to learn; the learner needs to be motivated to do so. Schnotz and colleagues acknowledge that motivation cannot change the cognitive structure of a learner, but they believe it is possible that motivation can influence working memory within some limits. This idea is partially based on the assumption that the working memory is connected to the long-

term memory and can be activated to a greater or lesser extent. Some limitation of working memory happens due to fading activity, and if more activity takes place, the working memory capacity will be increased. For instance, if someone is concentrating intensely on a task, more activation is happening in the working memory than when the person is concentrating less. Therefore, motivation could result in a temporary increase in working memory capacity (Schnotz, Fries, and Horz 2009).

As a result, according to Schnotz, Fries and Horz (2009), it is possible that seductive details increase learners' motivation and, consequently, their persistence, therefore fostering learning. They discuss experiments which showed that seductive details are detrimental to learning, and notice that these studies had two significant limitations that might have reduced the positive effect of persistence: the seductive details were weak or had no motivating effect; and the learning time was relatively short.

In agreement with Schnotz, Fries and Horz (2009), but looking at the need for a low cognitive load to learn, Park and colleagues (2011) notice another interesting limitation on the research about seductive details:

> *All of these studies showing a detrimental effect used scientific texts that explained concepts such as detailed differences between insects or the lightning process step by step. In contrast, the studies that did not show the detrimental effect of seductive details were using non-scientific texts (e.g. biographies). These results may suggest that seductive details can only interfere with learning within a high load learning process that requires managing the available cognitive resources. (Park et al. 2011, 268)*

If the results of the use of seductive details had different effects in different subject matters, it is possible that the seductive details in H&S information for children also have a singular effect, as they probably require low cognitive load.

In this sense, Park et al. (2011) argue that seductive details may not have a detrimental effect and could instead be motivational in materials that require low cognitive demands allowing an optimal use of the working memory since there are enough cognitive resources available to process them. Based on this assumption, they ran a study and found positive effects of seductive details when using pictures and narration. They suppose this might have happened because the learners were learning under low load condition, as pictures plus narrated verbal information is likely to have a lower cognitive load than written text plus pictures. Available working memory might help to process the seductive details, which cause no harm to learning if they are motivational for the students. Park et al. agree with Schnotz and colleagues (2009) above that the free working memory capacity will not necessarily be used in a productive way, but motivation could help this to happen. Park and colleague conclude that affective mediation happened because of situational interest rather than because of positive emotions; situational interest, however, can only be developed when there is a low load condition. Although their study focused on seductive details present in

verbal information and not in pictures, the structure of the H&S posters investigated in this thesis (i.e. little verbal information but medium or large-sized illustrated area) is likely to require a low cognitive load from children.

Table 14 considers the studies mentioned above that describe the effects of seductive pictures on learning while discarding the effects of seductive words. Since only pictorial seductive details are considered in this table they are called decorative pictures, which is what they are called throughout this thesis.

Table 14: Three possible effects of decorative pictures on learning, and their related studies.

Decorative Pictures…	Why?	Related Studies	Observations
have no influence on learning	Pictures increase positive affect but do not help learning	Sung and Mayer (2012)2009	Distinguish decorative pictures from seductive pictures; the former do no harm
		Magner et al. (2014)	It happens on far knowledge transfer
harm learning	Decorative pictures grab the learner's attention, creating extraneous overload on the learner's limited cognitive capacity	Mayer (2009); Moreno and Mayer (2007); Pike et al. (2010);	For people with low prior knowledge and for less able learners
		Sung and Mayer (2012)	Distinguish decorative pictures from seductive pictures; the latter harm learning
foster learning	Decorative pictures help to motivate the learner to engage with the subject; this is more likely to happen if the learner is under a low cognitive load	Um et al. (2012)	It happens on recall and knowledge transfer
		Mayer and Estrella (2014)	By making relevant information appealing
		Plass et al. (2014)	It happens on comprehension, not on transfer
		Schneider, Nebel and Grey (2016)	It happens on for some types of decorative pictures (conducive)

As observed in the table above, different variables are used in the different studies and the authors have different views on the subject matter. There are some views that all the research above has in common: (i) decorative pictures might increase positive affect and motivation in learners but this is not sufficient to make learners engage in the learning activity; (ii) under high cognitive load conditions, such as those needed during complex activities, or for low prior knowledge learners, decorative pictures are detrimental to the learning objective; (iii) therefore, under low cognitive load conditions, such as when there is little new information or when the relevant information is highlighted to help the learner to focus, decorative pictures should have a fruitful outcome when they are included in learning activities.

5.1.4 Cognitive theories and H&S information for children

As discussed above, no significant research that investigates the cognitive processing of pictorial and verbal information in materials such as posters was found. It is likely that the cognitive processes involved in such activity are similar to those described in the CTML and the

CATLM. However, it is possible that cognitive overload is less likely to happen, because of the small amount of information in posters due to their characteristic of quick communication (described in Chapter 2, page 9). In this sense, four important points from the cognitive research mentioned above to take into account when transposing the theories discussed in that research to the informational material of this thesis are listed next.

1. Some studies included words as seductive details, these might result in a different interference in learning than pictures;

2. Scientific text (often tested in the studies above) is different regarding layout and objectives from H&S printed information for children. The first usually aims to instruct the learner about complex subjects; the second needs to attract the learner's attention and instruct him or her in a concise way and focused issues;

3. Seductive details might be either harmless or beneficial for learning when in low cognitive load situations;

4. Motivation might play a role in cognitively engaging the learner.

Besides the above points, another aspect to take into account in transposing these theories to the topic of this thesis is children's cognitive development. The research discussed in this chapter mainly focuses on university students or children older than the age group considered in this thesis. Children are in constant cognitive development, and some particularities of each age group should be considered when designing for them. Thus, this matter is briefly discussed next.

5.2 Children's developmental stages

Piaget's theory of developmental psychology describes four stages of child development: sensorimotor, preoperational, concrete operational, and formal operational. Operational refers to the mental schema transformations children develop at these stages using symbolic reasoning. The H&S information considered in this research often targets children between 6 and 12 years old, who are approximately at the concrete operational stage, also known as middle childhood (7 to 11 years old). Acknowledging that the Piagetian stages do not have sharp contrasts between each other and should instead be seen as age trends (Flavell, Miller, and Miller 1993), it is relevant to look at the two age extremes within the targeted group (i.e. 6- and 12-year-olds). Children at these ages are on the borderline between the previous and the following Piagetian periods of cognitive development. Six-year-olds are leaving the preoperational stage, or early childhood, and entering the concrete operational stage, while 12-year-olds are likely to have just left this stage and are entering the formal operational period, or adolescence. During the concrete operational stage, children develop the ability to think and reason concretely, and their abstract thinking develops.

In each developmental stage, children tend to demonstrate different cognitive changes that could influence the way they observe and understand H&S information. Children in early childhood seem to focus on what is salient and interesting to them, neglecting the other relevant features of an array of stimuli. Children in middle childhood are

likely to achieve a more balanced, decentred perceptual analysis. At this stage children also 'seem to be more sensitive to the basic distinctions between what seems to be and what really is' (Flavell, Miller, and Miller 1993, 134). On the other hand, these children usually look at the presented reality and struggle to move to the possibility; they fixate 'on the perceptible and inferable reality right there in front' of them (Flavell, Miller, and Miller 1993, 139), while adolescents are more apt to begin thinking about the possibilities and then proceeding to reality.

Besides these cognitive changes (plus others not considered here) identified by Piaget, the researchers Flavell, Miller, and Miller (1993) propose additional influential factors that affect children's cognition. They say, for example, that while children grow there is an increase in their domain-specific knowledge and in their information processing capacity, that they also improve existing competencies, and that there are advances in their metacognition, metacognitive knowledge, and monitoring and self-regulation. These cognitive changes have an impact on children's likehood of understanding pictorial and verbal information presented to them, as discussed next.

Implications of children's developmental stages for information design

In a literature review presenting research findings about warnings for children, Rice (2013, 24) suggests that the effectiveness of warnings for children depends on children's, 'understanding of the message (written or pictured) and their ability to conceptualise, apply logic, and associate the warning with their behaviours and consequences of their actions'. Children's limited ability to extrapolate in verbal reasoning is demonstrated by the way children do specific activities, such as looking for information online. Hirsh's (1999) investigation into children's relevance criteria and the information they use when how they seek for books on electronic resources provides evidence that 10-year-old, for instance, look for results that match the exact words they searched for. According to her, these children, as concrete thinkers, had difficulty in retrieving information that did not fit the exact words they searched for, even if the content of the sources they find contained relevant information. Although this study is somewhat old, and children nowadays might be better trained to search for information online than they were in 1999, the fact that children 'failed' to investigate results because they could not look beyond their titles shows that children at the concrete operational stage have difficulty with what does not match their understanding of the question, as the author points out.

Hirsh's (1999) study, however, focused on a search using words. H&S posters often present pictorial information that requires children to think beyond what is depicted. Perhaps the message communication is not completely affected by the difficulty children at the concrete operational stage encounter have in moving to the possibilities if all of the information is presented in the verbal part of the poster and the picture complements it. However, no investigations were found about what might be the effect of pictures that are unrelated to the message (i.e. decorative pictures or seductive details) in H&S posters for children, even though such pictures are evident in much of the H&S

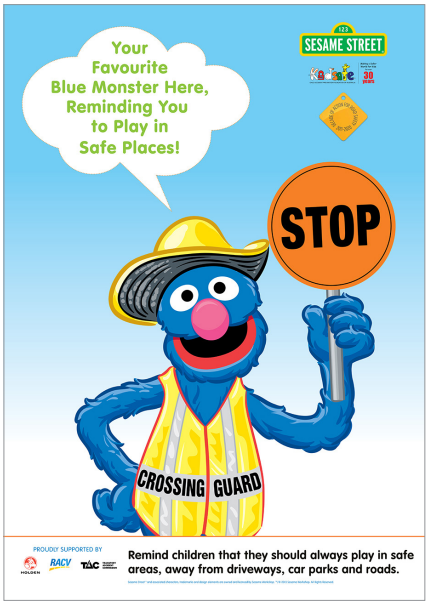

Figure 35: Decorative picture depicting no information relevant to the poster's message in a road safety campaign poster, size A1, aimed at children (no specific age range identified). Source: Sesame Workshop & Kidsafe Victoria, Australia, retrieved in 2007.

information corpus gathered. Figure 35, for example, shows a poster from an Australian road safety campaign depicting a character from the famous television series *Sesame Street*. The famous character might attract children's attention, and perhaps might validate the message, as discussed in Chapter 2 (in the section called Main character), but his presence alone does not provide any relevant information. In this case the whole safety message is written in the character's speech balloon.

The increase in children's working memory during the concrete operational stage might influence their understanding of pictures. Very young children, for example, do not seem to understand the relevance of illustrations and fail to use them as retrieval cues to remember stories (Greenhoot and Semb 2008). Greenhoot and Semb (2008) tested very young children's (3–5 years of age) recall of a story told with and without pictures and noticed that the details recalled were those that were present in both the narrative and the pictures rather than those only present in one or the other. They found that verbal information plus an irrelevant picture had no facilitative effects on story recalls, suggesting that the pictures did not increase motivation or attention to the listening task in very young children. They say it could be that the improvement in the working memory across childhood meant that the older children to had a better memory of the stories.

Pike, Barnes, and Barron (2010), on the other hand, tested the effect of pictures accompanying texts on the inference making of children aged from 7 to 11 (concrete operational stage). They concluded that the mechanism responsible for suppressing irrelevant information becomes better with age. Working memory is a significant predictor of children's ability to make inferences and increases with age (Pike, Barnes, and Barron 2010). In this study, Pike and colleagues found that pictures might facilitate or interfere with inference making depending on the information depicted. Pictures presenting competing or conflicting information interfered with the inference making, an effect that was reduced as age increased.

Likewise, Murphy and Wood (1981) tested children's use of photographs as instructions for constructing a wooden pyramid, and found that all of the children between the ages of 4 and 8 were able to use the pictures as a source of instruction, but there was a systematic increase in the ability to use them successfully (Murphy and Wood 1981). Later, Martin and Smith-Jackson (2008) tested instructions for toys' assembly with children from 6 to 9 years old and also concluded that the ability to successfully use the pictures for the task increased with age. The 9-year-olds in this study assembled parts more quickly, more accurately, and with fewer usability problems. They also looked less to the instructions than the 6-year-olds, which according to the authors is related to the development of working memory speed and capacity; the less they looked the less complex they should be finding the instructions. These findings demonstrate children's use of pictures as a source of information evolves with age, the older they become the more successful their strategies are.

This chapter discussed cognitive theories of processing multimedia materials, the role of motivation in learning and children's cognitive development. It identified that although no research was found testing the assumptions of the CTML or the CATLM in children, the cognitive development research shows that as children grow their cognitive abilities increase. Thus, these cognitive theories and developmental theories should be considered together. In order to test some of the assumptions that have arisen so far and the role of informative and decorative pictures in children's understanding of H&S information, two studies were conducted. The first is discussed next; the second is a follow-up study on the results of the first.

Chapter 6 | First H&S posters study

Two studies using H&S posters for children were conducted for this research. The first is discussed in this chapter. Initially the design of the three posters tested is explained, followed by the discussion of other materials and methods used in the study. The report of how the study was conducted with each school year is made separately and is later combined and compared in a general discussion of the results. The study limitations and conclusions are discussed at the end of the chapter.

The study discussed here emerged from the results of the analysis of the sample of H&S information for children and supporting theories, as previously discussed. To summarise [12], in posters, pictures' role is accentuated due to this type of artefact's limited space that, in H&S information for children, is usually mainly occupied by pictures. Knowing that informative pictures contain relevant information and potentially help the comprehension of messages formed of pictorial and verbal information, it seemed safe to assume that these would be the type of pictures mostly used in H&S information. It was surprising to find that decorative pictures are also frequently used despite the lack of agreement surrounding the validity of using such pictures in learning artefacts.

The research discussed earlier on this thesis, however, did not focus on single-pages documents such as posters, which usually contain large pictures and a short piece of verbal information. Bearing in mind that studies about the use of decorative pictures in these artefacts are scarce and that it is indicated that it is common practice to illustrate them with non-informative pictures, the first study was developed and conducted. The study aimed to examine three different visual approaches to H&S posters and their influence on children's engagement with and ability to elaborate from the poster's content, as well as their preference for the posters.

12 See Chapter 2 for the use of pictorial elements in H&S posters; Chapter 3 for the relationships between pictorial and verbal information, which defines informative pictures as used in this thesis, and Chapter 4 for a demonstration of medium-size and large images in H&S information for children. Chapter 5 considers the cognitive processes involved in learning from pictures and words.

6.1 Materials – designing the posters

Three posters were designed using the same verbal information and colours but with different pictures. The main message of the posters was to warn children not to text on a mobile while walking. The risks of using a phone while walking have been demonstrated in recent studies (Hatfield and Murphy 2007; Neider et al. 2010; Stavrinos, Byington, and Schwebel 2011), and texting was found to be more unsafe than talking on the phone (Schwebel et al. 2012). Even when making cognitive pauses to refocus on looking at the road while texting, the participants of Schwebel et al.'s (2012) study committed several errors regarding road safety. Despite being a current issue, this topic is not often addressed in safety campaigns aimed at children, suggesting that the purpose of the study is a novel one. Also, this topic was unlikely to put children at imminent risk or frighten them. Although SMS communication (i.e. texting) is not typical of 7- and 8-year-olds as they usually do not own mobiles and are not adept at texting, many children of these ages use their parents' phones to play games and watch videos, and hence are at the same risk as those texting while walking. These posters also work as

education about future risks for this age group.

The typical features identified in the analysis of the sample of H&S information for children (Chapter 4) were used to guide the design of the posters. In the analysis, 17 trends were found and 14 were used in at least one of the posters, according to the features tested. They are (numbered according to the list on page 54) (i) drawings, (ii) synoptic images, (iii) large/medium-size figurative pictures, (iv) large combined illustrated area size, (v) primary and secondary verbal information, (vi) conspicuous primary verbal information, (vii) colourfulness, (viii) associated pictorial and verbal information, (ix) children as the main characters, (x) happy facial expressions, (xi) cheerful pictorial atmosphere, (xii) neutral verbal information visual atmosphere, (xiii) neutral verbal information atmosphere, and (xvi) instructive verbal information. Poster 1 included all these selected typical features and exemplifies them, as shown in Figure 36 below.

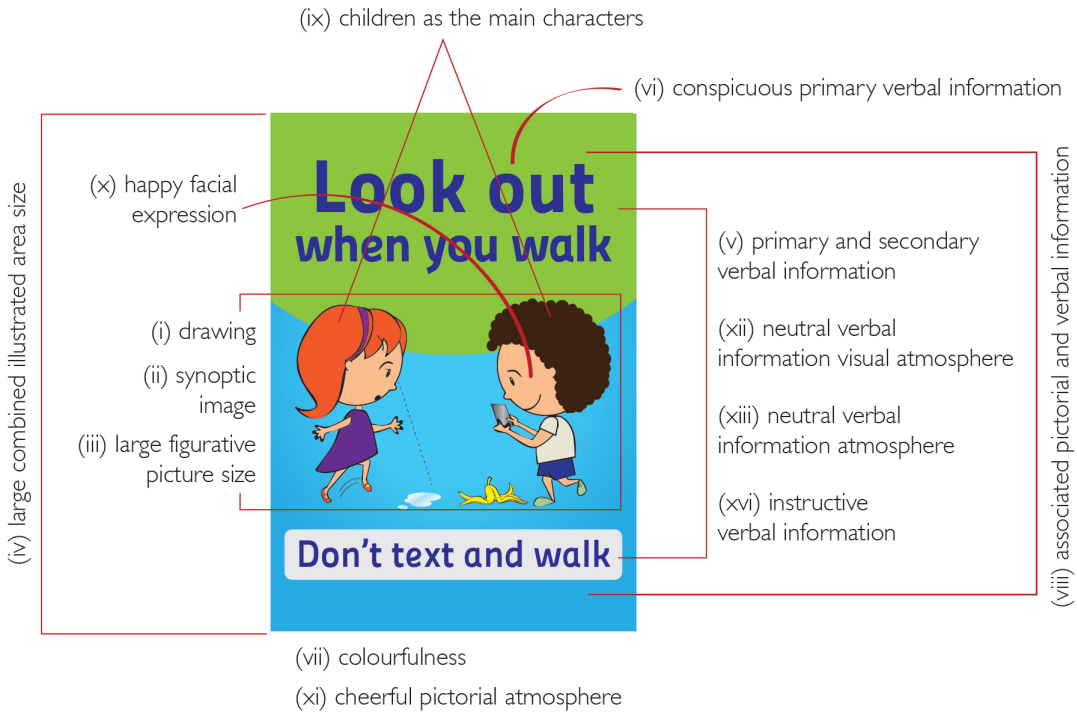

Figure 36: Typical graphic features identified in the analysis of H&S information for children, demonstrated in Poster 1, that were tested in the studies.

The posters were tested regarding the three remaining typical features identified in the analysis. The first is (xiv) verbal information valence, which was frequently neutral (24 out of 64 examples) or positive (23 out of 64 examples). Despite the evidence that people recall and respond better to affirmative instructions, the posters tested used both affirmative and negative verbal information, a combination that appeared 14 times in the examples analysed. One of the reasons for this is the lack of research investigating the efficiency of both affirmative and negative instructions used together; another more important reason is that using only positive sentences in the posters would make the information seem incomplete (e.g. 'look out') or possibly confusing (e.g. 'walk without texting'). Thus, in this the posters of this study, primary and secondary verbal information are used; the first is affirmative (i.e. 'look out when you walk') and the second is negative (i.e. 'don't text and walk'), and they complement each other. Although it was not present in the majority of material, a combination of the two types of information was present in

the sample analysed.

The second feature tested was (xv) pictorial intention (or behaviour depicted), which was typically identified as contextualising a subject or depicting correct behaviour. The first is used in Poster 2, with decorative pictures (see Figure 37 and Figure 39 below). The second, however, is depicted in combination with incorrect behaviour in Poster 1 in an informative picture (see Figure 37 and Figure 38 below). Although there are risks in showing incorrect behaviour to children as they might imitate it, no research that investigated the use of depictions of comparison between correct and incorrect behaviour was found, which is similar to the situation regarding verbal information valence mentioned above. The incorrect behaviour in Poster 1 is depicted as a way of inducing children to think about the consequences of acting in such way. Showing consequences is not much explored in H&S information for children despite evidence that it could be the best option in some cases (see pages 50 and 52, where the Think report is mentioned). Additionally, when children are involved in activities with H&S artefacts, the contradictory information might encourage them to discuss the issues to develop their own answers, and learn the information. This might relate to the research which shows that materials that create confusion might be beneficial for learning because confusion engages learners in cognitive flow, creating better learning outcomes than when no confusion is created (D'Mello et al. 2014). Note that in Poster 1 the picture's relevant information is emphasised by graphic features, as suggested by Mayer and Estrella (2014); the banana skin is bright yellow, contrasting with the background to highlight the hazard, and the girl's look is shown with the dashed line, suggesting she can see what is in front of her.

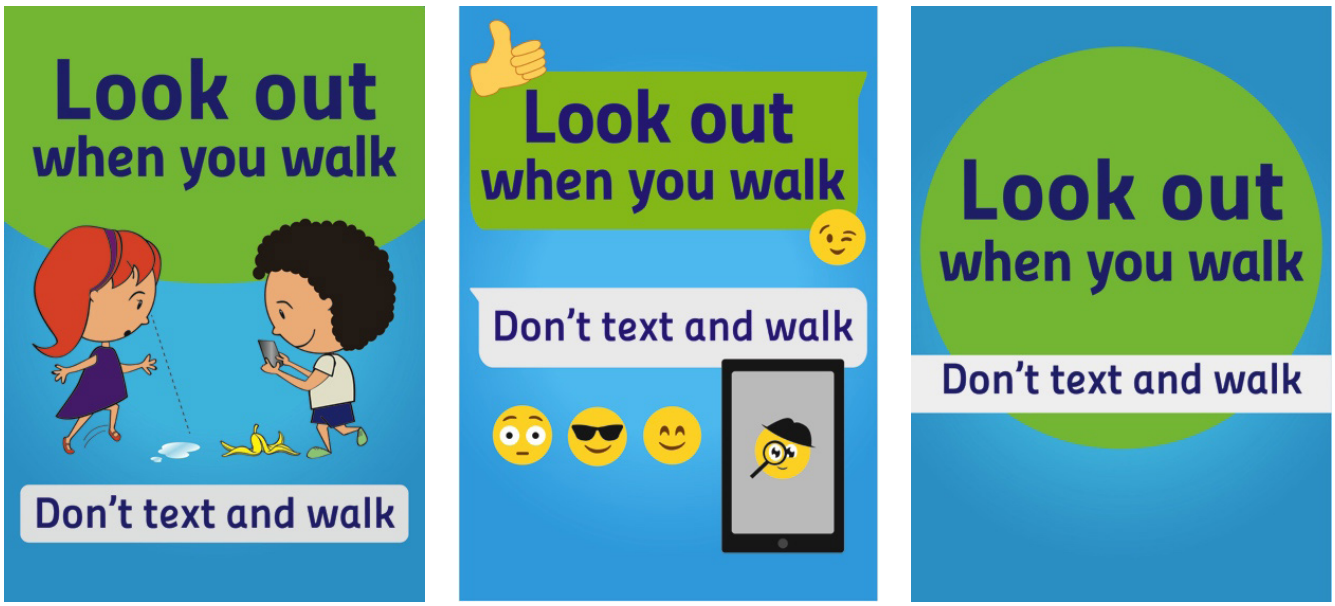

Figure 37: Comparison of the three posters tested in the study for similar (e.g. colours, typography, verbal information) and divergent (pictorial information) features. From left to right: Poster 1, with an informative picture, Poster 2, with a decorative picture, and Poster 3, with no picture.

Finally, the third typical feature found following the analysis that was the most important one tested on the posters is (xvii) the use of informative and decorative pictures. Each of these types of pictures are used in one poster to examine children's responses towards them. The similar and divergent features of the posters can be compared in Figure 37, where the three posters are shown.

The verbal and pictorial elements in Poster 1 (shown in a larger size in Figure 38) reinforce and add information to each other. The girl looking at the puddle (i.e. correct behaviour) and the words 'look out' reinforce each other. The boy texting while walking (i.e. incorrect behaviour) towards a banana skin adds extra information to the sentence 'don't text and walk', showing a possible risk of this activity, i.e. slipping over. There is also another possible interpretation that the two children could bump into each other.

Figure 38: Poster 1, with informative pictorial information.

The picture in Poster 2 (Figure 39) is decorative, with no relevant informative function; even though the emojis [13] depicted in this poster relate to the theme, they do not add any information to the text or reinforce it. Note that while there was a potential hazard in using emojis for decoration because study participants might have tried to read meaning into them, the emojis used in the poster were selected not to have a relevant meaning, either individually or combined, and there was no evidence in children's comments that they had tried to 'read' meaning into them.

13 Emojis are ideograms used in electronic messages. They derive from emoticons, which are pictorial representations of facial expressions using typographic punctuation marks.

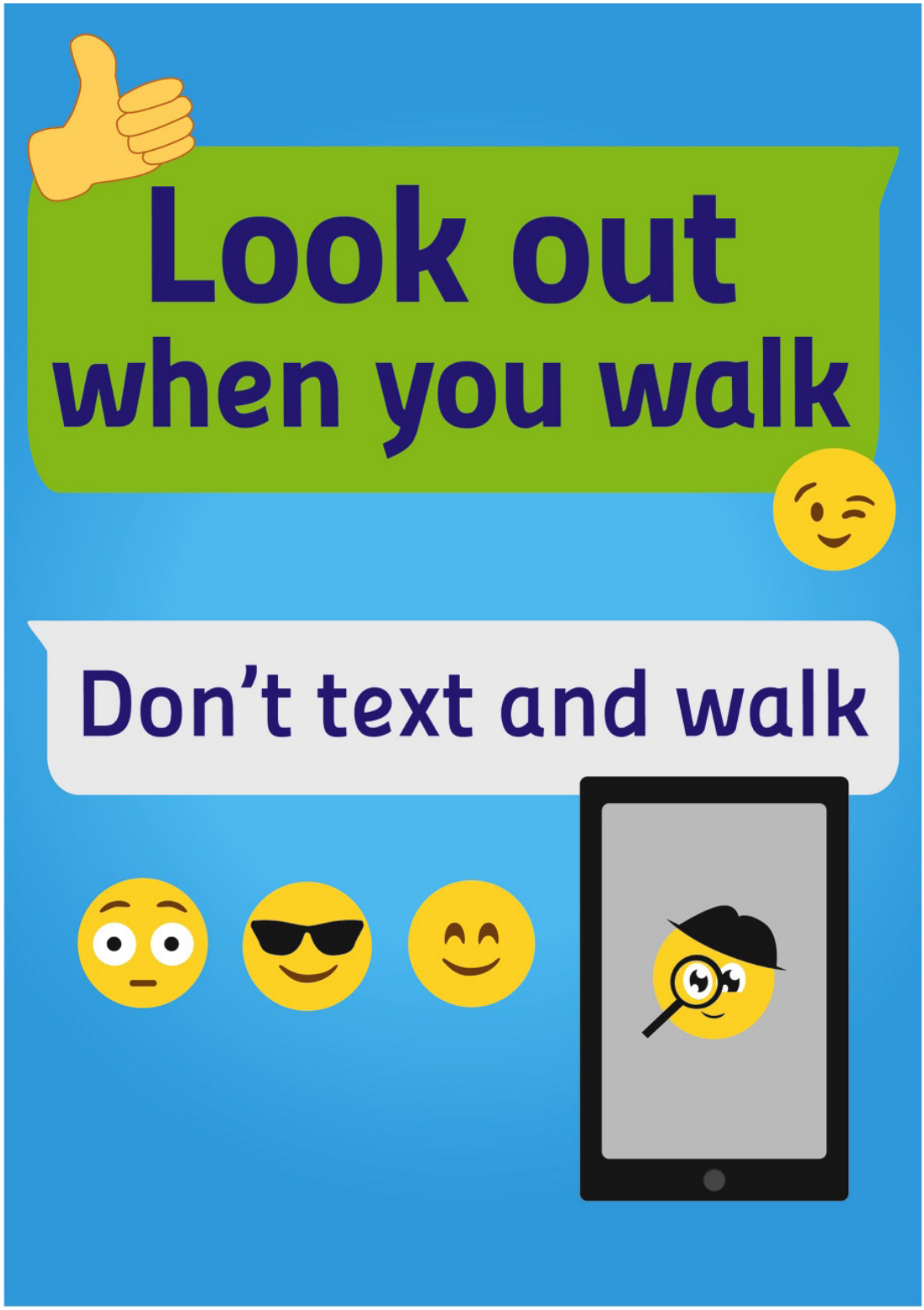

Figure 39: Poster 2, with decorative pictorial information (emojis).

Finally, Poster 3 (Figure 40) comprises only verbal information, enhanced by colours and geometrical shapes. This poster was used as a control poster to establish the contribution of pictorial and verbal information to the other two posters.

Figure 40: Poster 3, with no pictorial information.

The hypothesis of the study was that the main message, 'don't text and walk', would be communicated to children in the three posters but that there would be differences across conditions. Poster 1 would provide more detailed information, invite elaboration on the topic, and be participants' favourite because of its synoptic and colourful image depicting children, which were recurrent features of the sample analysed.

Poster 2 was predicted to be second favourite, but was thought to be less likely to stimulate extrapolations on the topic than the first poster. Poster 3 was predicted to be the least favourite and less likely to expand the topic.

6.2 Method

The study comprised three stages, applied in two different classrooms.

Stage 1 – introduction to the H&S topic

The schoolteachers led the first stage, which lasted approximately 5 minutes. They first split the class into three groups of six to eight children with mixed abilities who were known for working well together. Teachers then introduced the H&S theme by asking questions, such as what is H&S and what children could do, or should not do, to stay safe.

Stage 2 – poster presentation

Following the introduction of the H&S theme, each student group received four copies of one of the three posters, in A4 size. The groups discussed the poster they had and ways to be safe. The children then worked in pairs within their groups. Each pair received the Be Safe template shown in Figure 41 and made lists of *dos and don'ts* for being safe in daily activities. They were told their answers could be based on the poster, on the previous class discussion, or on any other ideas; the aim was to try not to push the children to describe the posters specifically. This stage lasted around 10 minutes.

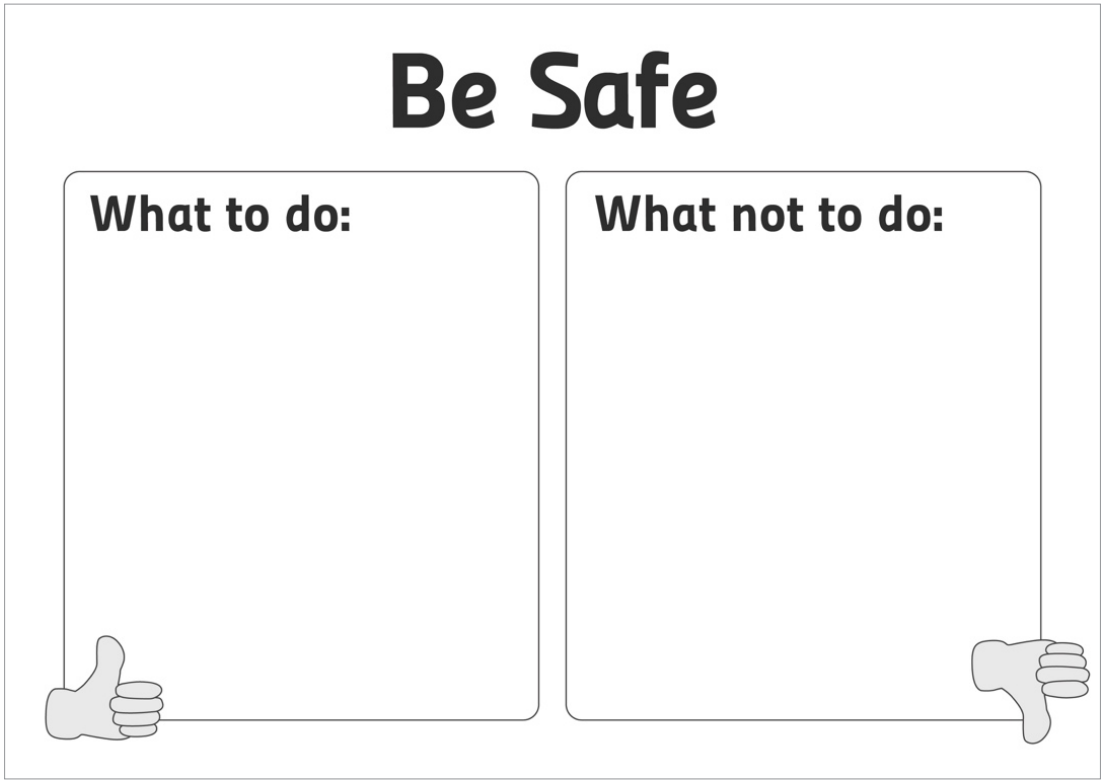

Figure 41: Be Safe list (size A4) distributed to the children so that they could make lists of the ***dos and don'ts*** of being safe in daily activities.

Stage 3 – discussion with the researcher

During the third stage, each group met the researcher in a separate room, apart from the other groups. The researcher initially asked the children, 'What should you do to be safe whilst using a mobile?' The children

answered this initial question without looking at the posters. After they had answered, the researcher showed all three posters to each group of children and asked which one they liked the most and why. This process was repeated with all groups. This stage lasted approximately 20 minutes.

6.3 The study

Participants

The study took place at a junior school in Reading (referred here as school A), Berkshire, on 9 January 2017 with 19 children from Year 6 (aged 10–11) and 11 January 2017 with 24 children from Year 3 (aged 7-8). Participants' gender was not taken into account for this study. Each age group worked in three groups of six to eight children with mixed abilities.

The study received ethical approval from the University of Reading. All of the children's parents signed a consent form allowing them to participate in the study. Additionally, as the study was introduced to the children in class, they were told that they did not have to take part and could leave before or during the study.

Study circumstances

Although the general method was the same for both year groups, the children from each year group displayed different behaviour, partly due to the different configurations of the rooms where the study took place. The children from Year 6 sat with their groups throughout the study; in contrast, the children from Year 3 walked around the classroom during the discussion about the posters, possibly allowing some of them to see other groups' posters. Year 6 had a spare room available with a table and chairs next to their classroom, where they could talk to the researcher privately during Stage 3. Year 3, however, had an informal landing area next to their room, in which children were walking around and jumping on beanbags placed there. Hence, the children in Year 3 were more dispersed and less focused on the posters and questions than those in Year 6. It was also evident that some children volunteered answers more than others, although all of the children were encouraged to respond. Thus, the written task complemented the oral task.

The reason the posters were not put on the walls, as might be expected for such materials, is that they are often presented to children in the classroom in a similar way to that used in the study. By talking to teachers prior to the study, I learned that teachers introduce new H&S materials to children during regular classes and that organisations that visit schools do the same.

Results

The written Be Safe list provided an overall view of the children's interpretation of each poster's condition and also allowed a comparison between them. The responses given during the discussions at Stage 3 corroborated the written interpretation and provided additional information. The poster preference data complemented children's written and spoken responses and helped explain some of the written answers.

The children's answers on the Be Safe list were classified according to their proximity to the posters' message, from more related to less related on a six-point scale, as follows:

1. sentences advising 'don't text and walk'
2. variations of posters' verbal information (e.g. 'look where you are walking')
3. answers related to the posters' topic (e.g. 'don't play Pokémon Go')
4. answers possibly triggered by the picture (e.g. 'look for dangerous things')
5. irrelevant pictorial information (e.g. 'do not litter')
6. unrelated advice (e.g. 'don't play with fire')

Although children wrote this list in two columns, one for dos and one for don'ts, no important differences were found between the ways in which they wrote each column, and therefore they were collapsed to analyse the data. For the full separate lists, see Appendix 1.

6.3.1 Year 3 results

Each group in Year 3 was composed of eight children, which means that each group had four pairs of children working in Be Safe lists. Different reactions to the posters among the groups became evident during Stage 2. Whereas the groups working with the posters with pictures, i.e. Posters 1 and 2, were attentive to the posters and discussed them, the group that received Poster 3, which had no pictures, showed no interest in it and completed its lists without observing the poster.

In the group that received Poster 1 (Figure 38), only two pairs of children wrote down the main message of the poster, i.e. don't text and walk, and another pair of children wrote a variation of this. The fourth pair of children did not write any advice related to the poster's message, and the most common subject they wrote about was road safety. There were also two sentences that were possibly triggered by the picture, and one was considered to be irrelevant information since it said 'don't skip in a wet area'. Figure 42 shows how these and the other answers were distributed through children's Be Safe lists.

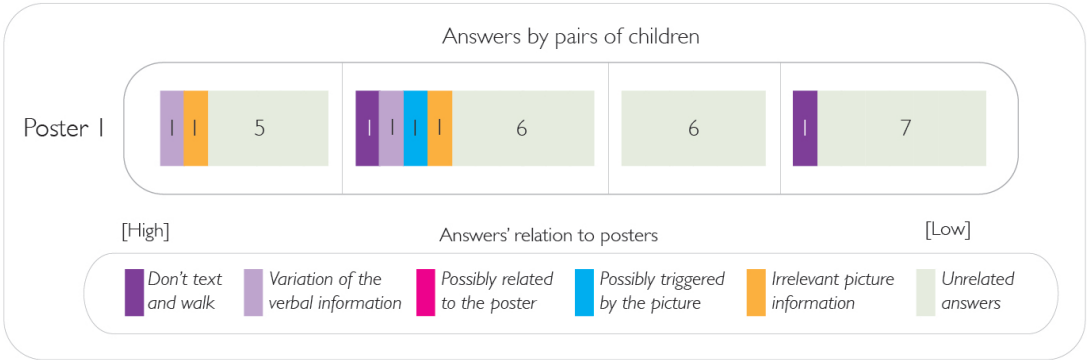

Figure 42: Dos and don'ts written in Be Safe lists by Year 3 children who received Poster 1, which contained informative pictorial information; numbers of answers by pairs of children.

During the discussion with the researcher, the children who had Poster 1 said they should be careful not to crash into a pole and should not walk while using their phone or walk on a road with it. One child, contradicting the poster's instruction, said that she/he walks while using her/his iPad. These children also talked about internet safety. All eight

children in this group preferred Poster 2 and said that Poster 1 was boring and was meant for younger children. No one liked Poster 3.

As seen in Figure 43, of the children who received Poster 2 (Figure 39), three pairs wrote variations of 'don't text and walk' in their Be Safe lists. Other advice that could be related to related to the poster's theme appeared too, such as 'don't play Pokémon Go' and 'don't text on your iPhone'. The first example seems to refer to walking while on the phone, as this is required to play this game; the second example seems to be missing 'while walking' at the end. Besides these examples, all the other advice written was in regard to road safety.

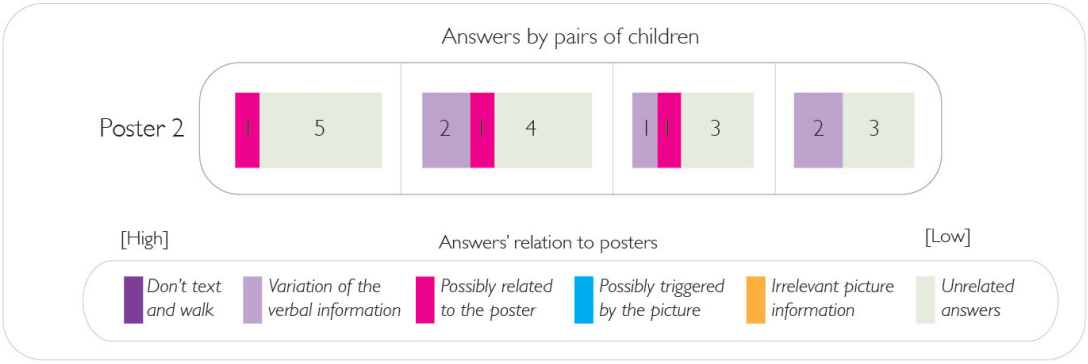

Figure 43: Dos and don'ts written in Be Safe lists by Year 3 children who received Poster 2, which contained decorative pictorial information; numbers of answers by pairs of children.

The group of children who had Poster 2, when speaking with the researcher, talked for a brief moment about safety with phones and then moved on to general safety. They said people should put their mobile down when crossing the road because they might fall or could get run over. Internet and road safety were once more the themes of the conversation. Six of these children preferred Poster 2 and only two chose Poster 1 as the best poster.

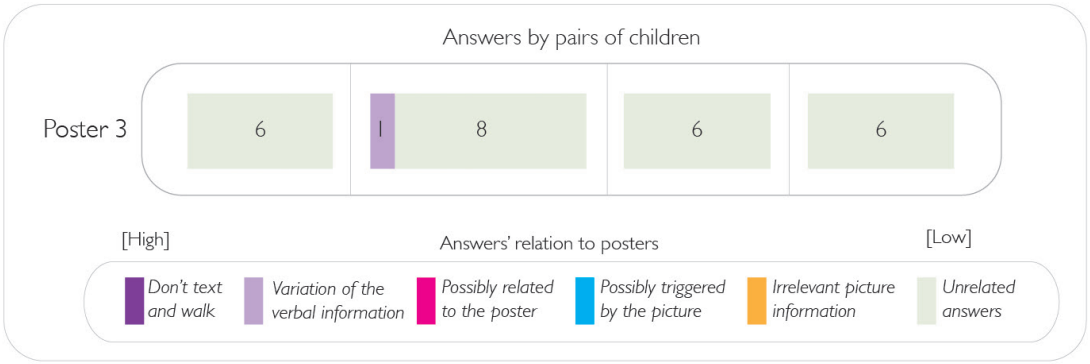

Figure 44: Dos and don'ts written in Be Safe lists by Year 3 children who received Poster 3, which contained no pictorial information; numbers of answers by pairs of children.

As already mentioned, the eight children who received Poster 3 (Figure 40) did not pay much attention to it and did the proposed activities while barely looking at their poster. Regarding the poster's topic, only one piece of advice appeared in the Be Safe list and was a variation on the poster's verbal information, as shown in Figure 44. There were two answers that could be related to the poster's subject; however, they were rejected as being related because of a lack of information within them. One of them said 'don't play games while crossing the road' and the other said 'look when crossing the road'. The first could be a reference to playing games on mobiles, but there was no evidence in the written task or in the discussion with the researcher to corroborate this hypothesis. It could not be confirmed whether the

second answer was related to the poster or to the children's general road safety knowledge.

Similarly to the other groups, the children who received Poster 3 talked mostly about internet safety during the discussion with the researcher. Only one child mentioned briefly that people should not walk on the road using a phone because they would not be looking at the cars coming. Six children from this group preferred Poster 2 and two preferred Poster 1. They were excited about the emojis and said they have emoji toys and that is why they liked that poster; one child justified the choice 'because the emojis are everywhere [in the poster] and not only on the phone'.

6.3.2 Year 6 results

This class was split into two groups of six children and one group of seven children. In this configuration, the group that received Poster 1 (Figure 38) had seven members and was split into two pairs and one group of three children to complete the Be Safe list. These three groups wrote in their lists that they should not text and walk and two of them also wrote variations of the poster's verbal information. Some of the children wrote some irrelevant advice that was not related to the main topic but to the drawing' (e.g. 'don't litter' and 'warn the person by telling them there is something in the way'). Other sentences, such as 'look for dangerous things', were possibly triggered by the picture; the intention of this sort of advice, however, was not clear. Other general, non-related H&S advice also appeared in all Be Safe lists, such as 'don't drink and drive' and 'keep your sugar levels low', in some groups more than others, as shown in Figure 45.

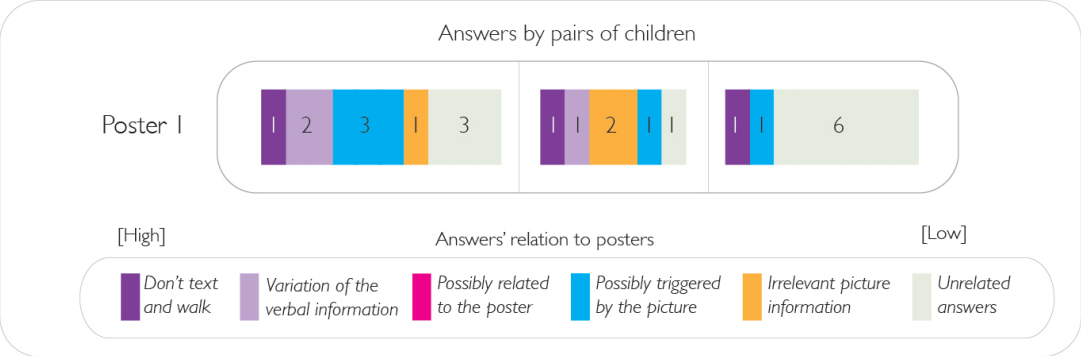

Figure 45: Dos and don'ts written in Be Safe lists by Year 6 children who received Poster 1, which contained informative pictorial information; numbers of answers by pairs of children.

During the discussion with the researcher, initially most children talked about internet safety, a subject that had not appeared in their written lists. They then talked about the poster's subject, explaining the reasons why people should not walk or run while using their phones – i.e. because they could hurt themselves, fall over, or walk into something. Some children, however, moderated the issue by saying 'as long as you're looking at where you're going you can walk and text' or 'in your bedroom, for example, you can walk and text'. At first, when looking at the three posters during the final stage, most of the children said they 'love emojis'. One student, who was the most vocal and led the responses, said she/he preferred Poster 3 (which has no pictures) because it is big and bold and that she/he would definitely pay attention to it if she/he saw it somewhere. She/he seemed to be somewhat of a

group leader and other children followed his position. In the end, three children preferred Poster 3 and four preferred Poster 2 – two of these four said that if there were no emojis, using only the speech balloons would be better, which seemed to be a statement arising from the agreement that the poster with only verbal information was better. This group also analysed very literally the poster with an informative picture, with which they had previously worked. They thought that a banana skin would not be on the floor, and if it were, it would not be such a vivid yellow unless someone had just dropped it. Reasoning from this last statement, one child mentioned that it is not the child's fault (for texting and walking) if someone else has littered with the banana skin.

The group of children that received Poster 2 mostly wrote in the Be Safe lists about other H&S issues rather than the poster's topic. The main subjects were road safety and some health matters. Only one pair wrote 'don't text whilst driving, walking'. These answers are classified as shown in Figure 46.

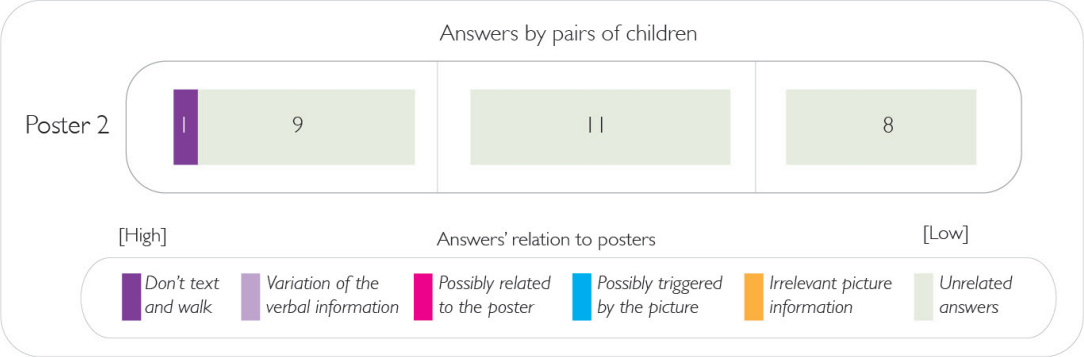

Figure 46: Dos and don'ts written in Be Safe lists by Year 6 children who received Poster 2, which contained decorative pictorial information; numbers of answers by pairs of children.

Similar to the Poster 1 group, the children that received Poster 2, during the discussion with the researcher, started talking about internet safety. Only after being prompted to talk about texting and walking did said they should not do it because they could drop the phone. One child mentioned that people should not play Pokémon Go because they are not looking while walking and they could walk into roads or bump into someone, which shows some awareness of the issue, but this could have been created prior to the study due to this game's popularity at the time of the study. When the children saw all three posters, they thought the intended message of Poster 1 was more obvious than the others. They quickly perceived that the boy in the drawing could slip over or both children could bump into each other. They said that looking at Poster 2, which they received at the second stage of the study, 'you wouldn't guess' what it is about, while with Poster 1 they could see what it is about straightaway. They continued discussing the poster with an informative picture and did not reach an agreement about whether the characters would or would not bump into each other since the girl could see where she was walking. Finally, all six children preferred the informative Poster 1 (with the informative picture) and thought the other two posters were boring.

All six children who received Poster 3 (Figure 40) wrote on their Be Safe lists mostly about road safety rather than about the main topic of the poster. Two pairs of children mentioned 'don't text and walk' or a variation of it, though. The third pair wrote 'look where you are going',

which, considering that this poster had no pictures, could be related to the sentence 'look out' in the poster. The relation of their answers to the poster's topic can be seen in Figure 47.

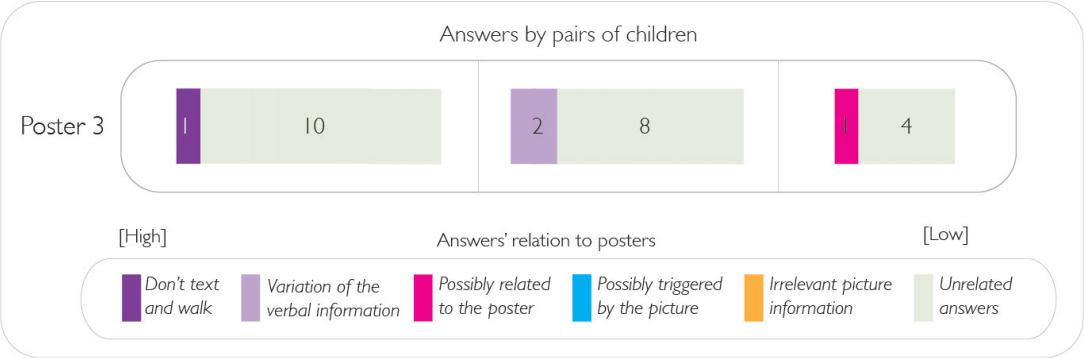

Figure 47: Dos and don'ts written in Be Safe lists by Year 6 children who received Poster 3, which contained no pictorial information; numbers of answers by pairs of children.

During the last stage of the study, when talking with the researcher, one child explained that if people are texting and walking they are not looking at the cars and cannot see them coming, showing some understanding of the issue. Other children complemented this comment, saying they could trip over and break their arms or walk into people who are only looking at their phones and not where they are going. However, one child said, 'if you are walking and texting in a piece of road [it] is probably a bit OK if you have an occasional look up'. Someone else argued against this, saying people could walk into a lamppost. Besides the poster's topic, they also talked about internet safety and road safety. When looking at all three posters, they said that Poster 1 is more self-explanatory than the others and that they would have to read Poster 2 and think about it. Although they emphasised that 'emojis are cool', all six children preferred Poster 1. They discussed the scene depicted in Poster 1 and found it amusing; they also understood that the girl would not fall because she was seeing what was happening around her.

6.4 First study discussion

The results of this study indicated differences in posters' impact depending on the picture's condition (informative, decorative, and control with no picture) and on children's age. Poster 1 was more effective for older children than younger children, stimulating more discussion and elaboration of the theme. Among the younger children, although half of the group that saw Poster 1 advised not texting while walking, the majority of this group's answers were about a variety of other topics. In contrast, looking at the answers of the groups that received Poster 2, in both age groups there is an indication that the younger children gave more relevant responses to it than the older children. Half of the answers of the younger children who looked at Poster 2 were related to the poster's topic, whereas older children who looked at Poster 2 had comparatively few related responses and more general road safety advice. Poster 3 seems to have transmitted information to older children better than Poster 2. For younger children, however, this poster proved to be ineffective. None of them liked the poster; they did not pay much attention to it during the study and made no reference to the poster in the writing activity. Additionally, the only

reference this group of children made to texting while walking during the discussion with the researcher was about road safety. Figure 48 compares children's written advice according to their school year and which poster group they were in. The results of the study that relate to different aspects of the posters are discussed next.

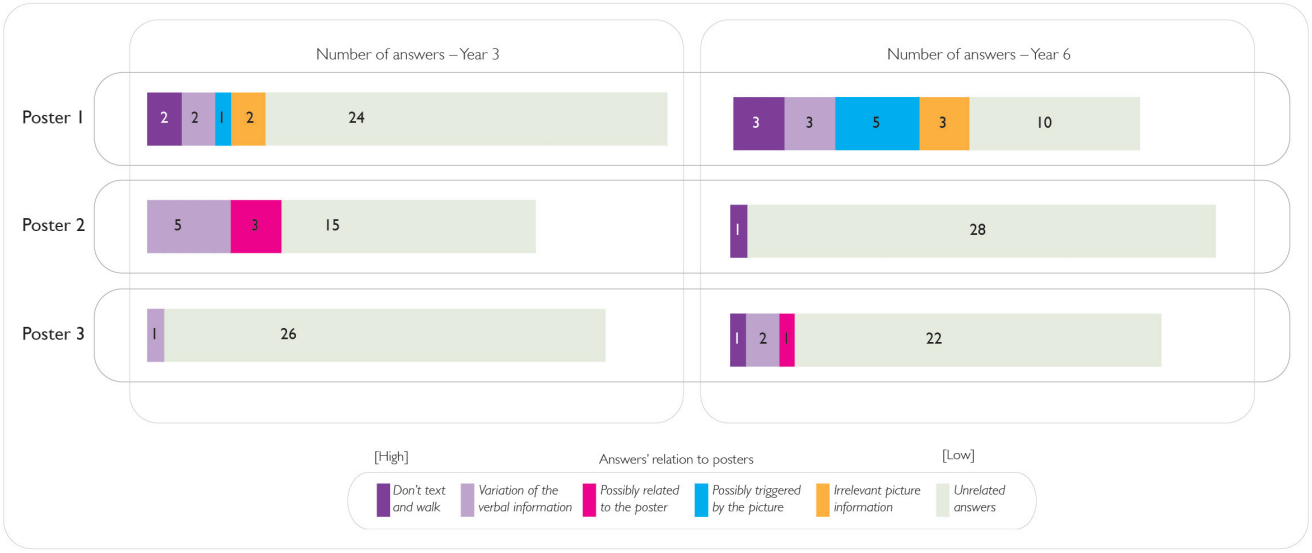

Figure 48: Comparison of the written answers of Year 3 and Year 6 in their Be Safe lists by poster groups.

6.4.1 Impact of informative picture, decorative picture, and no picture

The results suggested that Poster 1, with the informative picture, communicated the message intended better than Poster 2, with the decorative picture, although this varied across the two age groups. The richest responses about the posters' theme in both written and discussions tasks were from children in Year 6 who initially worked with Poster 1. However, they also focused on some irrelevant aspects of the picture, such as the littering problem and picture realism. The younger children who worked with this poster had a less intense response towards it, worrying less about the realism of the picture. These children reported less irrelevant information present in the picture; some of them were associated with the poster's topic (e.g. 'don't look down') and others were off topic (e.g. 'don't skip in a wet area').

The finding that both age groups seeing Poster 1 made specific comments about the picture suggested that the children extracted information from the picture. Feathers and Arya (2012) showed that when reading storybooks, children understand the pictures as part of the plot, and they include the information from the picture when retelling the story. Similarly, in the present study, children reported some details of the scene depicted in the informative picture that were not necessarily related to the main topic. Mayer and Fiorella's (2014) *coherence* principle states that learning materials should include words and pictures that are relevant to the instructional objective or they risk overloading the reader's cognitive capacity. Likewise, Herrlinger et al. (2016) suggest that learning materials with pictorial elements could shift attention from verbal information to pictorial, reducing learning when compared to oral verbal explanations and pictorial information. Note, however, that Herrlinger et al. and Mayer and Fiorella write from the perspective of designing learning materials as textbooks, not posters, which the present study considers. Still, perhaps the extraneous details, such as the banana

skin on the floor, shifted the attention of some of the children from the main topic, disrupting the communication of the central message. In a case like this, such details could be better excluded than included, in accordance with the CTML.

When the three posters were shown together, the older children who had not previously seen Poster 1 immediately understood the scenario depicted, saying that this poster was obvious and self-explanatory without the need to read it, whereas Poster 2 required to be read and thought about. In contrast, Year 3 children who worked with Poster 2 made more suggestions related to the poster message, such as 'look where you are going', than the other groups from the same year, and more suggestions related to phones, such as 'don't be on your phone when crossing the road' than the Year 6 group working with the same poster. These results suggested that younger children paid attention to Poster 2's verbal information, perhaps led to do so by the presence of the emojis, which they liked. As discussed earlier in this thesis, pictures can please children and arouse curiosity and enjoyment. The emojis may have had a similar effect here to the well-known cartoon characters that influenced children's responses to products in Roberto's et al. (2010) and Neeley and Schumann's (2004) studies. At a cognitive level, the emojis may have worked as contextual cues that helped the younger children associate the poster's message with their previous knowledge, adding the potential to make the information more memorable, as previously mentioned in Chapter 2. Additionally, the emojis could have acted as *transformational* pictures as defined by Carney and Levin (2002). They suggest such pictures might help the comprehension of a text acting as mnemonic illustrations.

Finally, as expected, Poster 3 stimulated less discussion and response about texting while walking, although Year 6 responded to it more than Year 3.

6.4.2 Verbal information

Two types of verbal information are considered in this discussion: the text written on the posters and the wording children used to express themselves in the Be Safe lists. Recapitulating, the primary verbal information of the poster is affirmative (i.e. 'look out') and intends to attract the viewer's attention; the second is negative (i.e. 'don't text and walk') and specifies the poster's theme by giving an instruction. In this study, the combined used of affirmation and negation does not seem to have had any detrimental effect. On the contrary, both seem to have been equally reproduced in children's written responses.

Nonetheless, the expression 'don't *text* and walk' could be problematic for the younger children as some of them wrote 'don't *play* on your phone while walking' rather than 'don't *text*'. Perhaps they did not relate themselves to texting as much as older children did; the latter group frequently used the expression in the poster and commented that they walk while using phones/tablets and could do this in their bedrooms without being in danger. Still, the fact that the Year 3 children also wrote 'don't drink and drive' and other safety advice intended for adults rather than children showed their awareness of such themes and

suggested that there is a public policy of getting messages to children early, so teaching them about texting while walking would not be a major issue, and would possibly teach them for the future.

The expression 'look out' appeared several times in both age groups' responses, but did not necessarily relate to texting while walking. The choice of these words could have been influenced by the primary verbal information of the posters or could reflect children's regular use of the expression. Either reason suggested that this sentence is appropriate for children. Still, the fact that Poster 3, formed of verbal information only, prompted only one relevant response from Year 3 suggested that using only appropriate wording was not enough to engage younger children with the poster's message. This hypothesis was reinforced by Year 3 children's answers to the other posters with pictures that were more successful in prompting responses.

6.4.3 Poster preference

Before testing the posters, I hypothesised that most children would prefer Poster 1 because of its colourfulness and the somewhat humorous scene depicted. However, 24 children chose Poster 2 (20 of them from Year 3) while only 16 preferred Poster 1 (12 of them from Year 6). Although three children chose Poster 3 (with only verbal information) as the best, this response was attributed to the strong views of one child who led others to choose it. The older children's preference for Poster 1 was supported by their comments that it was self-explanatory, whereas the preference of most of the younger children for Poster 2 was demonstrated by their enthusiasm for emojis; the preference pattern was reflected in children's Be Safe lists, where the older ones seem to have extracted more information from the informative picture than from the decorative picture, or from Poster 3, which has only verbal information. On the other hand, the emojis had a minor advantage for the younger children because they helped the comprehension of the message, possibly by maintaining children's attention. As discussed in Chapters 2 and 5, emotions might have an influence on people's engagement with campaigns, their willingness to learn topics associated with pictures, and the attention they pay to different aspects of the pictures. The children's preference for posters is shown in Table 15 (Year 3) Table 16 (Year 6).

Table 15: Year 3 children's preference for posters.

Groups identified by the poster presented initially	**Year 3 Poster Preferences**		
	1 *(informative picture)*	**2** *(decorative picture)*	**3** *(no picture)*
1: Informative picture (n=8)	0	8	0
2: Decorative picture (n=8)	2	6	0
3: No picture (n=8)	2	6	0
Year 3 class (n=24)	**4 children**	**20 children**	**-**

Table 16: Year 6 children's preference for posters.

Groups identified by the poster presented initially	**Year 6 Poster Preferences**		
	1 *(informative picture)*	**2** *(decorative picture)*	**3** *(no picture)*
1: Informative picture (n=7)	0	4	3
2: Decorative picture (n=6)	6	0	0
3: No picture (n=6)	6	0	0
Year 6 class (n=19)	**12 children**	**4 children**	**3 children**

6.5 Study limitations

• Small number of participants: the study was conducted in just one small school, and hence only a small number of children were involved. More participants would have strengthened the findings, enabling more confidence in the trends shown in the data collected in the study.

• Use of one set of materials: using only one set of materials limits the findings since the children only saw one example of each type of poster. Using more posters with some subtle variations across examples could have strengthened the findings.

• Study environment was not consistent: as described, children from Year 3 were more mobile and dispersed than those in Year 6 and, notwithstanding differences in cognitive capacity because of age, are likely to have been less focused on the test materials. Although the younger children's behaviour could have been influenced by the environment, it is important to consider that this could be typical in schools, and potential distraction should be taken into account when designing H&S information for this age group.

• Group rather than individual interviews: group interaction was particularly evident in one Year 6 group, in which one dominant child chose Poster 3 as his/ hers preference and others changed their choices to follow him/ her. Talking individually to children could have obtained personally generated opinions, although there might have been a corresponding loss in response breadth had the children not been able to interact with one another. In this study I was fortunate to have data from the children's Be Safe list responses to balance against the group effect regarding the preference responses.

• Initial discussions about H&S: the teachers' introduction to H&S as a context to the study might also have influenced children's responses to the activities. Showing the posters without directing children's awareness of the topic might have elicited different responses.

6.6 First study conclusions

The main outcome of this study is that children aged 7 and 8 appear to have different responses towards the posters tested than 10- and 11-year-olds. This finding is relevant because H&S campaigns often target an age range of between 6 and 12, which spans these two groups with the same materials. There might, however, be a benefit in using different approaches. The response difference in the study could be a consequence of children's developing cognitive abilities and their visual literacy changes, which may also account for the greater ability of the older children to extract information and extrapolate from the informative picture poster.

Four assumptions were made after examining the study results and are further investigated in a follow-up test (see Chapter 7).

1. Older children appear to benefit more from posters with an informative drawing than younger children. It seems that the children from Year 6 had a better understanding of the informative drawing and could extract more information from the scene depicted than the younger children. This could be a consequence of their developmental stage; given the complexity of the scene depicted in Poster 1, children had to understand and compare two different conditions (i.e. the boy's and the girl's actions) to make sense of the poster's meaning. As discussed in Chapter 5, older children have a greater working memory capacity and therefore more ability to understand complex information than younger children. As they grow and enter the formal operational stage (at 12-13 years old) they also become more capable of thinking of possibilities rather than only focusing on what is put it front of them. Although children from Year 3, when prompted to look carefully at the drawings, could see the differences between the two situations in Poster 1, they were much more focused on the emojis they liked in Poster 2 than on the drawing that needed to be 'read' and understood. Additionally, the older children's greater domain-specific knowledge may have played a role, as they might already have been familiar with the subject or similar subjects, as well as probably having a higher repertoire of making sense of images than younger children.

2. Even older children may be distracted by details in complex informative drawings (such as the banana skin on the ground) that draw attention away from the main topic. Ten and 11-year-olds focused on information present in the picture that was not necessarily related to the poster's central message, i.e. texting and walking. They wrote and talked about other issues such as the littering problem, which was elicited by the drawing of a banana skin on the floor. As defended by Mayer (2009, 85–173), extraneous details in learning artefacts might divert attention from the man topic and therefore be detrimental to learning because they cause the cognitive capacities to become overloaded. On the basis of this theory, one could assume that children, who are in the process of expanding their cognitive capacity, would be more affected by such overload than adults. Older children's fixation on the irrelevant pictorial information somewhat contradicts the suggestion made by the assumption number 1 above that they think of possibilities instead of only focusing on what is placed in front of them. Notwithstanding, children are in constant cognitive development and the Piagetian operational stages are not fixed and should be seen as age trends, so it seems plausible that this characteristic is typical of more than one stage as children evolve.

3. Younger children's attention to a poster may be driven by pictures they like the most, regardless of their relevance. The 7- and 8-year-olds responded more enthusiastically to Poster 2, with the emojis, than Poster 1, with an informative picture, even though both groups showed a similar understanding of the posters, as far as could be seen by the amount of accurate advice in their written responses. The younger participants in this study had recently left the preoperational Piagetian stage, during which they tend to focus on what is salient and interesting to them, neglecting other relevant stimuli. As the emojis were highly

interesting to them, they might have focused on them more than on the drawing on Poster 1, or on Poster 3, which has no pictures.

4. Decorative pictures may be effective in engaging younger children. These pictures seem to have been more helpful in situating topics for younger children than for older children. For the same reasons discussed in assumption 3 above, younger children could have focused on the emojis they liked, which draw their attention to the rest of the poster, i.e. the verbal information. Although Mayer's CTML defends seductive details – or decorative pictures as I call them here – are detrimental to learning, perhaps there could be a different effect of such details on children who are still mostly focusing on what is interesting to them and they could foster learning instead.

This chapter identified tendencies in children's responses towards the posters tested in the first study conducted with children in this research. In order to further investigate the four assumptions presented at the end and to cover some of the limitations of this study, a second study was conducted in two different schools, as discussed in the next chapter.

Chapter 7 | Second H&S poster study

Following up the results of the previous study this chapter discusses the second study conducted with children in this research. First, I will describe the materials' development and will then describe the study, setting out in detail the development of the analysis framework, which was done using the KJ method (Scupin 1997) and the gathered data. The research was carried out in two schools and the results are presented in detail for each school and then a comparison of the findings at each site was done; a discussion of the broad themes that arose from the results appears later in the chapter

This study was developed in order to validate the results of the first study. Taking into account the limitations identified in the previous poster tests, some modifications to the materials and methods were made. This time five posters were used, and the study was conducted in two different schools and with two classes in each.

7.1 Materials – new posters

With new informative and decorative pictures, two new posters, numbered 4 and 5, were added to the three already tested. Poster 4 is a variation of Poster 1 and uses the same drawing style, but the new informative picture avoids aspects (possible extraneous details) of Poster 1 that elicited discussions about issues not relevant to the artefact's main message, i.e. littering and the realism of the picture. The new scene, shown in Figure 49, portrays a boy texting and walking and about to bump into a pole. Instead of the comparison between correct and incorrect behaviour depicted in Poster 1, this poster only shows the incorrect behaviour. Although this is not a common approach in H&S information for children (demonstrated in Chapter 4's sample analysis), and there is a risk that children might imitate the undesired behaviour, in this particular case the incorrect behaviour is likely to result in an image that is easier to interpret than the correct behaviour. The depiction of someone walking without a mobile would probably miss the link with texting and walking and could be seen as a decorative picture instead. Thus, although it is unusual and not regularly recommended to depict incorrect behaviour, it is depicted in Poster 4. Additionally, in this poster the primary verbal information is unified with the drawing, as if it is part of a warning in a street sign. As in Poster 1, graphic features emphasise relevant information, i.e. the four lines next to the pole at the height of the child's head highlight the pole, suggesting the boy is about to hit his head.

Figure 49: Poster 4 with a simpler informative picture than Poster 1, size A4.

Below in Figure 50, the complex informative picture in Poster 1 (on the left) can be compared with the simplified informative picture in Poster 4 (on the right).

Figure 50: Poster 1 (L) with an informative picture and Poster 4 (R) with a simplified informative picture, both size A4.

The new Poster 5, shown in Figure 51 (next page), includes a decorative picture that is not as current ('trendy') as the emojis in Poster 2 are nowadays. This poster depicts five happy children who have no apparent relation to texting and walking. Additionally, a mobile appears on the poster near the verbal information to make a subtle connection to the poster's topic. Unfortunately, this drawing presented a problem during the study that was not noticed prior to it: some children thought the boy at the bottom right was throwing the phone in the air due to the position of the mobile and his arms.

The decorative pictures in Poster 2 and Poster 5 can be compared in Figure 52. The full set of five posters tested in this study are shown in Figure 53, which includes the three original posters and the two new ones.

Figure 51: Poster 5 with a decorative picture without emojis, size A4.

Figure 52: Poster 2 (L) with emojis as a decorative picture and Poster 4 (R) with happy children as a decorative picture, both size A4.

Figure 53: The five posters tested in the second study. From left to right: Poster 1, Poster 2, Poster3, Poster 4, and Poster 5.

7.2 Methods

In an attempt to address the limitations that might have influenced some of the results of the first study, the methods underwent a few modifications. The issues raised by the previous study that could be modified in this study were the number of participants, the use of only one set of materials, and orientation in the initial teacher-led discussion. The aim of conducting the study in two schools was to add more participants to the study; the addition of two more posters allowed evaluation of subtle variations across the sample; and the initial discussion with the teachers was replaced by a baseline question to assess individual children's knowledge of the posters' topic prior to the test session. Other issues raised in the first study could not be controlled, such as the environment where the tests took place, as they depended on the schools' facilities. Likewise, the discussions with the children took place in groups again, as talking to them individually would have required more time than the schools allocated for the study.

Stage 1 – baseline question

Each class was split into five groups of children and every child received an A5 sheet of paper, shown in Figure 54, on which to write their answer to the baseline question 'What do you need to be careful about when walking around with a phone?' The question was read aloud by the researcher and intended to assess children's previous knowledge of the topic communicated on the posters.

Figure 54: Template of the baseline question of the second study, size A5.

Stage 2 – poster presentation

During the second stage, each group of children received up to five copies of one of the five A4 posters depending on the number of children in the group. Each child also received the same 'Be Safe' list used in the first study, reproduced here in Figure 55. Instead of working in pairs, this time the children individually wrote their lists of 'dos' and 'don'ts' for when using a phone. Initially they looked at the poster provided for their group and discussed it with the rest of the group; later they were asked to make lists inspired by the posters, but not necessarily restricted to them.

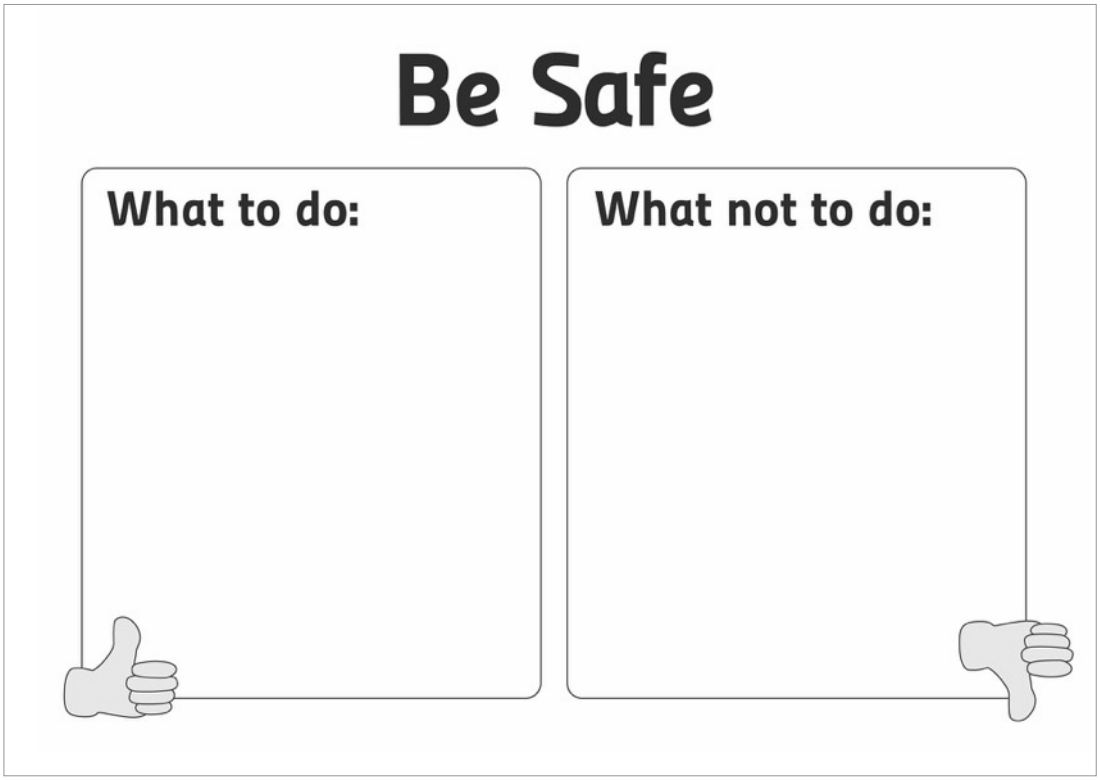

Figure 55: Be Safe list, size A4.

Stage 3 – discussion with the researcher

During the third stage, each group met the researcher in a separate room from the other groups. First, with no poster visible the researcher asked the children 'What do you need to be careful about when walking around with a phone?'; the aim of asking this question was to verify any differences and similarities between their spoken and written answers within their groups and in comparison to the other groups. This session was voice recorded when parents permitted, and the researcher took notes throughout the study.

Stage 4 – poster preference

Still in a separate room from the other groups, the five posters were presented to the children and they were asked which one they preferred and why. This session was also voice recorded when possible. The researcher also took notes throughout the study.

7.3 The structure of the study

The study received ethical approval from the University of Reading. All of the children's parents signed a consent form allowing them to participate in the study and indicating whether or not they consented to their children being voice recorded. Additionally, as the study was introduced to the children in class, they were told that they did not have to take part and could leave before or during the study.

Participants

Two schools participated in this study. As with the study at school A, children from two school years including the age range of 7 to 8 years old (Year 3) and 10 to 11 years old (Year 6) were selected. A junior school in Sheffield (referred here as school B), UK, was the first school

to participate on 23 September 2017. In total 45 children volunteered to participate in this school, 17 of them in Year 3 and 28 in Year 6. On 25 September 2017, the study session was repeated at a junior school (referred here as school C) in Wokingham, UK, with 37 children in Year 3 and 26 children in Year 6, totalling 63 children. Across both schools 108 children took part in the study; their gender was not taken into account.

Study circumstances

Unfortunately, as with the first study, the environment in which the study took place was difficult to control. In both schools, children were walking around the classrooms and some of them possibly saw each other's posters during the first stage, generating some contamination. Additionally, the discussions stage with three of the four classes happened in areas where school staff and/or other children could walk around, which frequently disrupted the conversation.

7.4 Establishing an analysis framework

Due to the many variables in this second study (two classes in each school, five posters tested through two written tasks and an oral activity), the results from each class were initially analysed separately using the KJ method of thematic analysis (Scupin 1997). The results were then compared to those of the classes within the same school, followed by a comparison between the schools.

The KJ method was chosen because it helps to organise complex, immeasurable, idiosyncratic, non-repetitive, behavioural, qualitative data (Scupin 1997). This method works 'bottom up' so that the higher-level themes are derived directly from the data (in this case the children's written comments) and not from the researcher's preconceptions of potential themes. The KJ method consists of four steps. The first step is *label making*, i.e. giving labels to the issues or concepts expressed in an individual comment, and this includes writing on cards concepts related to the problem. These labels are written on cards so that they can be organised spatially. At the second stage, *label grouping*, the cards are assembled into groups that combine concepts with similar topics. The cards can be reallocated as many times as necessary to form consistent groups. Each group is then assigned a title or a more generalised concept that identifies families. Thus, related concepts are organised into clusters with a higher-level label. *Chart making* is the following phase and involves making a chart of the labelled groups and families to demonstrate relationships between them. The chart can have arrows indicating cause and effect relations or the order of occurrence, interdependence, connections, or contradictions. The final phase is the *written or verbal explanation* that clarifies the chart, and this aims to integrate the data while distinguishing higher-level interpretations from descriptions (Scupin 1997). In the present analysis, individual charts were made using the data provided by each class; however, the groups' labels were the same throughout the four analyses. At the end of this process, a general chart could be formed that included all groups and families of the four independent analyses.

Label making

Following the KJ method, key concepts extracted from the children's answers in the two written tasks were written on cards. To define the key concepts, sentences with a similar meaning, such as 'don't text and walk' and 'don't look at your phone while walking', were considered to be the same concept, which in this case is 'don't text and walk'.

Label grouping and chart making

Similar written concepts were grouped by moving the cards around several times to find the best matches by topic; Figure 56 shows the groups' formation. Ten groups were formed in this process, and they belonged to five higher-level families.

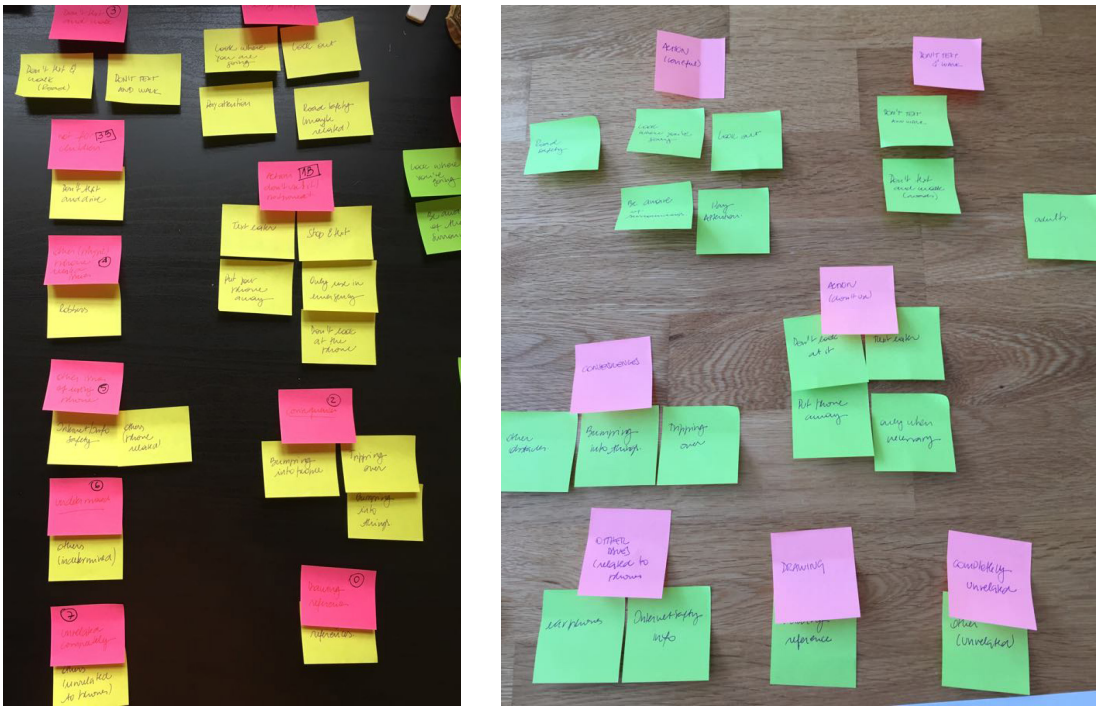

Figure 56: Label grouping process. Key concepts on the yellow (left) and green (right) cards grouped together; above them, on the pink cards, the names of the families being formed.

In the chart, each group was positioned within its family from left to right according to the similarity of their topic with the topic of the posters tested, as indicated in the bar in Figure 57. The further to the left on the chart a family is, the less related it is to the posters' topic; the further to the right on the chart a family is, the more it is related to the posters' topic. The families' names describe this correspondence; they are, from left to right: (a) unrelated to posters' message, (b) undetermined, (c) other phone issues, (d) don't text and walk issues and (e) description of posters' pictures.

Figure 57: Families' relation to pictures on the chart, indicated by positioning and colour – low relation on the left with the lighter colour, high relation on the right with the stronger colour.

The context in which each comment appeared was taken into account when creating topic labels for them. For instance, most of the road safety advice in the first written task was considered to be related to the use of phones, since children were answering the question 'What do you need to be careful about when using a phone?' Sometimes, however, in the second task the advice seemed to be exclusively about road safety and was independent of using phones, although this could

not be confirmed; this was the case for comments such as 'use the zebra crossing' and 'only cross when the green man is on'. In this sort of situation, comments were considered to be (b) undetermined. The higher-level families and the topic groups within them are presented below.

(a) Unrelated to posters' message

The family on the extreme left of the chart evidently has no relation to the posters' topic. Only one group belongs to this family, which is entirely disconnected from the other families of the chart and is described next.

• General advice: includes safety advice completely unrelated to the posters. Table 17 shows the concepts in this group and their occurrence during the two written stages at both schools that participated in on the study.

Table 17: Group concepts and occurrence of the (a) Unrelated to posters' message family.

Group	Concepts	Occurrence		
		Stages	1	2
General advice	Stranger danger Fire safety Road safety Child exploitation	School B – Y3	-	-
		School B – Y6	-	×
		School C – Y3	-	×
		School C – Y6	×	×

(b) Undetermined

Some of the sentences children wrote were dubious because their intentions were not identified. Consequently, their relation to the posters' message was uncertain. Only one group belongs to this family.

• Undetermined: includes sentences such as 'look both ways when you cross the road', which could be unrelated road safety advice or could relate to walking with a mobile. Another example is 'put your phone in a bag', which could have indicated a preoccupation with the safety of the device or could be suggesting avoiding using the mobile – put it away so you do not text and walk. Table 18 shows the concepts and occurrence of this group in the written activities.

Table 18: Group concepts and occurrence of the (b) Undetermined family.

Groups	Concepts	Occurrence		
		Stages	**1**	**2**
Undetermined	Road safety Keep the phone away	School B – Y3	×	×
		School B – Y6	×	×
		School C – Y3	×	×
		School C – Y6	×	×

(c) Other phone issues

In the two written tasks, some children wrote about mobile issues not related to texting and walking, such as the safety of the device. Interestingly, these risks were mentioned both before and after they saw the posters, which raised questions about whether, if children wrote them before having contact with the posters, these ideas persisted afterwards or whether these ideas only appeared after children saw the posters, suggesting that the posters elicited this kind of advice. The three groups in this family help to answer these questions by identifying when

and where these ideas appeared and the effects of the posters on them.

• Device safety: this issue appeared in many forms; there were some direct references to phones being stolen, dropped, or lost, and other instances appeared as general suggestions, such as 'keep it safe' or 'securely hold it'.

• Personal safety: this group concerns personal risks when using the phone but not those caused by texting and walking.

• Advice not suitable for children: some children wrote recommendations aimed at adults (relating to driving). The mention of these issues could demonstrate that children do not link themselves with the hazards of texting and walking, but also suggests the effectiveness of public policy of getting messages to children early.

Table 19 shows the concepts in each of these groups and their occurrence in children's answers in both written tasks.

Table 19: Group concepts and occurrence of the (c) Other phone issues family.

Groups	Concepts	Occurrence		
		Stages	1	2
Device safety	Having it stolen Dropping it Losing it	School B – Y3	×	×
		School B – Y6	×	×
		School C – Y3	×	×
		School C – Y6	-	×
Personal Safety	Calling or contacting strangers online Mobile applications' safety Personal information (phone number, location, social media) safety Headphones usage Listen to people Listen when crossing	School B – Y3	×	×
		School B – Y6	×	×
		School C – Y3	×	×
		School C – Y6	×	×
Advice not suitable for children	Don't text and drive Don't phone and drive	School B – Y3	-	×
		School B – Y6	-	-
		School C – Y3	-	×
		School C – Y6	-	×

(d) Don't text and walk issues

Children wrote 'don't text and walk' and also noted the consequences of doing this and actions that should be taken regarding this problem. Some of the ideas reflected the issues more accurately than others. Some of them were a direct representation of the posters' message, while others were elaborations on the main message, such as 'wait until you get home to text'. The two posters with informative pictures (Posters 1 and 4) depicted hazards people might encounter if texting and walking, which children mentioned in their written tasks. Interestingly, these issues were mentioned not only by children working with those posters but also by children who did not see them, and even before children had accessed any poster. In this last situation, they could not be classified as 'description of drawings' (which is the family next discussed). Hence, the family was important in determining *when* children wrote this type of advice and *who* wrote it in order to distinguish particular references to drawings, ideas that could have been triggered by the posters' theme regardless of the posters' picture, and children's previous knowledge.

• Take care advice: children advised taking care when walking with a phone by explicitly saying 'be careful' as well as giving implicit advice such as 'look at your surroundings'. The recommendations included in this group do not describe the drawings' features, although the pictures could have suggested them to children. Also included in this group are the sentences that start with 'look out', since they are possibly references to the verbal information in the posters. Finally, road safety advice related to phones is included in this group since it implies being careful (e.g. '[be careful with a phone] when you're on the road').

• Avoidance action: this group includes suggestions to avoid using a phone or to avoid walking and indicate an alternative action to texting and walking. Although the posters do not depict these ideas, they seem to have elicited such recommendations. Included in this group are suggestions for people to stop or sit down to text and to postpone the action.

• Consequences: children also wrote about the possible consequences of texting and walking such as those depicted in Poster 1 and Poster 4. Although these comments did not necessarily reflect an understanding of the posters' implications, they are likely to have been prompted specifically by the poster, hence their inclusion here.

• 'Don't text and walk': this group includes direct citation of the verbal information from the posters and similar statements indicating that people should not text and walk (e.g. 'don't look at your phone when walking'). Sentences recommending not texting and walking while on the road are also part of this group.

Table 20: Group concepts and occurrence of the (d) Don't text and walk issues family.

Groups	Concepts	Occurrence		
		Stages	1	2
Take care advice	Be careful	School B – Y3	×	×
	Be aware of the surroundings	School B – Y6	×	×
	Look out	School C – Y3	×	×
	Look/watch where you are going	School C – Y6	×	×
	Pay attention			
	Road safety advice			
Avoidance action	Stop to text	School B – Y3	×	×
	Sit to text	School B – Y6	×	×
	Wait until you get home	School C – Y3	×	×
	Do not use the phone	School C – Y6	×	×
Consequences	Be careful of lampposts	School B – Y3	×	×
	Bumping into things	School B – Y6	×	×
	Bumping into people/ hurting someone	School C – Y3	×	×
	Other obstacles (e.g. cars, rivers, trees)	School C – Y6	×	×
	Don't trip/fall			
Don't text and walk	Don't text and walk	School B – Y3	×	×
	Put the phone down while walking	School B – Y6	×	×
	Call instead of texting	School C – Y3	×	×
	Don't play on the phone and walk	School C – Y6	×	×
	Don't run while texting			
	Don't look at it while walking			
	Don't walk and take selfies			
	Don't walk with a phone in your hand			

(e) Description of posters' pictures

This family consists of only one group and includes answers children wrote after seeing one of the posters with pictures (all posters except Poster 3). Evidently, the references to pictures are unique to each poster. For example, when children who looked at Poster 4, which depicted a pole, wrote 'look out for lampposts', this was considered to be a description of the picture, while the same information written by children who did not see that specific poster was placed in the previous family (d). The position of this family on the right side of the chart, indicating a greater relation to the poster, often occurred due to the literal descriptions of the pictures. This position, however, does not necessarily mean that when children made these references they had learnt the primary information from the poster. On the contrary, sometimes it suggests that they were distracted from the posters' main information.

• Specific references to drawings: this group includes statements that somewhat describe the drawings on each poster, independent of the interpretation given to the drawing.

Table 21: Group concepts and occurrence of the (e) Description of posters' pictures family.

Groups	Concepts	Occurrence		
		Stages	1	2
Description of posters' pictures	Look out for people/slippery things/ puddles/banana peel Warn people about things on the floor Don't slip on a puddle Don't bump into a lamppost	School B – Y3	-	×
		School B – Y6	-	×
		School C – Y3	-	×
		School C – Y6	-	×

Chart arrangement and connections

As already mentioned, the chart is organised horizontally according to how much the families and their groups of ideas relate to the posters. Some groups within the same family are more related to the posters while others within the same family are less related and, accordingly, are placed more to the right (high relation to posters) or the left (low relation to posters). The groups are positioned vertically above one another when they relate to the posters equally; hence no hierarchy is represented vertically. The lines' characteristics indicate strength or weakness by being full or dashed respectively. A dashed line also marks ambiguous groups. The relations noted and codes used in the chart are outlined in Figure 58.

The lines between families and groups indicate their connections. For instance, the concepts of the 'undetermined' group are ambiguous and could mean 'device safety' or 'don't text and walk', and thus these groups are connected through a dashed (i.e. weak) line. Accordingly, 'don't text and walk' is the group with more connections; full lines link this group to those groups in which concepts are related to some extent. Consequently, 'specific references to drawings' is connected to the groups in which the concepts describe similar actions depicted by the pictures. As already mentioned, the concepts of the last group on the right side of the chart do not necessarily represent the posters' main

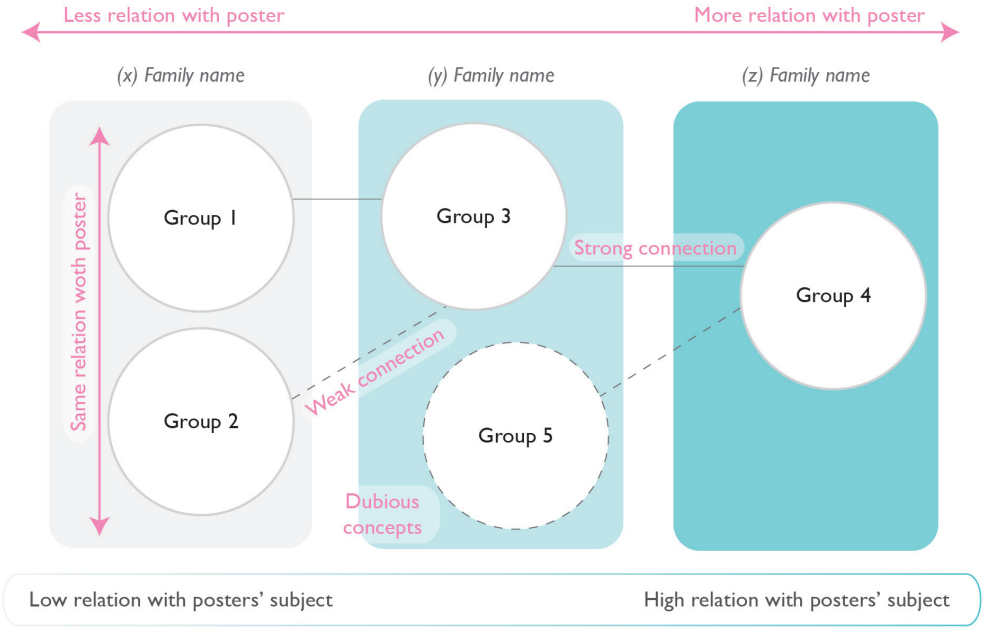

Figure 58: Chart codes outlined.

topic (i.e. do not text and walk); they do, however, always describe the pictures, which are part of the posters and also carry information – even though sometimes not the targeted information (e.g. do not litter). Figure 59, below, illustrates the chart that emerged from children's written answers using the KJ method.

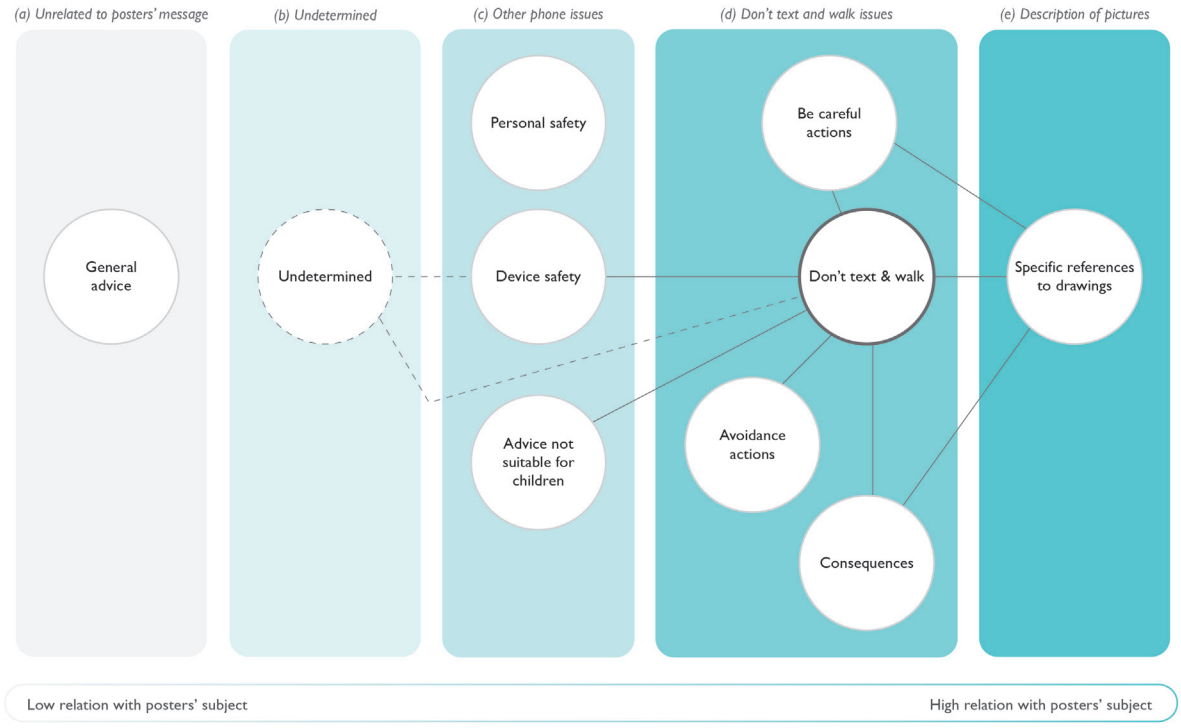

Figure 59: Chart of the families and groups and their relationships.

7.5 Study at junior school B

In contrast to how children were divided up in the school A (see Chapter 6), in this school the division of children into groups in both classes was based on their sitting position in the classroom and not on their abilities.

7.5.1 Junior school B's Year 3 results

Not all the parents authorised their child in Year 3 to take part in the study. Still, on the suggestion of the teacher, the whole class participated in the two written stages, provided that the answers of those children whose parents had not consented to them taking part in the study were not included in the data. Unfortunately, the class was split into five groups without taking into account children's parents' permission, resulting in groups formed of uneven numbers of components with usable data. Thus, there were groups with two, three, four, and six participants. Nonetheless, all four stages of the study were carried out as designed, although a few children were walking around the classroom and possibly were able to see other groups' posters, which may have influenced some of their answers. During the discussion with the researcher (Stages 3 and 4), each group of children met the researcher, who was accompanied by a school staff member, in an outdoor area.

Overall, there were no significant differences in the two writing activities (before and after seeing the posters) of the five groups of children in Year 3, although there was a reduction, although small, in unrelated phone safety advice and an increase in recommendations related to the central message of the posters following poster presentation. All posters seem to have been understood and the children focused most of their Be Safe lists on the posters' topic.

The four stages of this study are reported next. The answers of each group to the written activities (Stages 1 and 2) were tabulated according to the families and groups of concepts defined using the KJ method, described earlier (represented in the chart in Figure 59). Note that each child might have written more than one answer belonging to one family group; however, repeated advice in both positive and negative forms (dos and don'ts) from the same child were combined and recorded as one.

Table 22: School B Year 3's written answers of the group that received Poster 1, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 3 – Poster 1		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	**1**
Take care advice	2	**3**
Avoidance actions	0	0
Consequences	3	**0**
Don't text and walk	0	**2**
Not suitable for children	0	0
Personal safety	1	**0**
Device safety	0	0
Undetermined	0	0
General advice	0	0

Two children received Poster 1 and demonstrated awareness of texting and walking during Stage 1, when they specifically wrote advice about not walking into lampposts and not hurting other people. During the second stage, both children referred to the poster's message, writing 'don't text and walk', 'look when you walk', and 'be careful when walking

with a phone'. One child gave advice warning people about things on the floor, a clear reference to the banana skin and the puddle depicted in that poster. These children's answers are shown in Table 22 above. The family groups that were not mentioned are written in a light blue in the table, those that remained unchanged across tasks are in a light font, and those that increased or decreased in the second task are in a bold font.

During the discussion with the researcher, one child in the Poster 1 group referred to the littering problem, saying 'someone could drop litter and you could slip on it'. They also said people should look where they are going because they could bump into something. One child also mentioned the risks of looking at a phone while driving. When seeing all five posters, the two children in this group preferred Poster 1 (Table 23). They said they liked both Poster 1 and Poster 4 because they show what to do, but also liked Poster 2, which, according to them, 'also tells you what to do [in the verbal information]'.

Table 23: Poster preference of school B Year 3's group that received Poster 1.

Poster preference of the two children working with Poster 1				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
2	–	–	–	–

Of the two children working with Poster 2, one showed some familiarity with the poster's topic as she/he answered the first question by mentioning the risk of tripping over and hurting themselves while using the phone. The other child suggested putting the phone in a bag, which could be either an avoidance action or device safety advice. In the Be Safe list, both children recommended not texting and walking. Similarly to the previous pair of children, they also suggested that people should 'turn the phone off while driving'. Their answers are classified in Table 24 below.

Table 24: School B Year 3's written answers of the group that received Poster 2, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 3 – Poster 2		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	1	**6**
Avoidance actions	1	**1**
Consequences	1	**0**
Don't text and walk	0	**3**
Not suitable for children	0	**2**
Personal safety	0	0
Device safety	0	0
Undetermined	0	0
General advice	0	0

In the discussion with the researcher, these children mentioned road safety issues, again recommending turning off the phone while driving. They suggested keeping the phone in a bag so as not to get tempted to use it, showing a solution to the temptation to text and walk (or drive, since this seemed to have been their mindset) by avoiding it. The two children that were working with Poster 2 preferred Poster 1 (Table 25) because 'he is not looking where he's going and she is' and 'he's looking at his phone, he might slip on the banana skin'.

Table 25: Poster preference of school B Year 3's group that received Poster 2.

Poster preference of the two children working with Poster 2				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
2	–	–	–	–

Three children worked with Poster 3. In the first task there was one suggestion 'to look where you are going' and the others were regarding device safety and personal safety. When they received Poster 3, they did not show much interest in it. Two of them wrote not to text and walk in the Be Safe list, whereas the third one said that you should not 'play on your phone when you are crossing the road'. A new recommendation appeared in their lists as one child wrote that people should sit down to text. Their answers are classified in the following table, Table 26.

Table 26: School B Year 3's written answers of the group that received Poster 3, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 3 – Poster 3		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	1	**3**
Avoidance actions	1	1
Consequences	0	**1**
Don't text and walk	0	**2**
Not suitable for children	0	0
Personal safety	1	**0**
Device safety	1	**0**
Undetermined	0	0
General advice	0	0

The third stage of the study, the discussion, corroborated this group's Be Safe list, as they focused on recommendations to take care, and also clarified previously written advice. One child had answered the first task with 'do not to use the phone for too long' and repeated this in the discussion, but this time complemented it by saying that the mobile can heat and burn a person's body. They may have had a preconception of this issue. When asked to choose a poster, two children in this group preferred Poster 1, and one child chose Poster 4 (see Table 27). They said they did not understand Posters 2 and 5; what the latter shows, according to them, 'is just some children playing'.

Table 27: Poster preference of school B Year 3's group that received Poster 3.

Poster preference of the three children working with Poster 3				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
2	–	–	1	–

Four children formed the group that were given Poster 4. Two of them wrote only about device safety (e.g. dropping it; having it stolen) during the first stage, and the other two children recommended acting carefully when using a phone, mostly in regard to walking in the road, and showed some previous awareness of the poster's topic. After seeing the poster, none of the children mentioned device safety again, and all of them made some sort of reference to not texting and walking, either directly or suggesting stopping to text. Three of the four children made references to the drawing in the poster by either advising not to 'bump

into things' or specifically mentioning the lamppost. The differences between responses given during the first and second written tasks for this group are shown in Table 28.

Table 28: School B Year 3's written answers of the group that received Poster 4, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 3 – Poster 4		
Type of advice	**Task 1**	**Task 2**
Drawing references	**n/a**	**2**
Take care advice	**1**	**3**
Avoidance actions	**0**	**2**
Consequences	2	2
Don't text and walk	**0**	**3**
Not suitable for children	0	0
Personal safety	**0**	**1**
Device safety	**3**	**0**
Undetermined	0	0
General advice	0	0

At the discussion stage, this group of children started talking about the possibility of walking into things if they are looking at a phone. None of them mentioned at this point not to text and walk, but talked about other issues related to phones (e.g. taking their earphones out). All four children rated Poster 4 as their preferred one (see Table 29), although their immediate response was to like emojis and choose Poster 2. Only after considering all posters did they decide that the poster with which they had worked was the best because it showed what was happening. Additionally, they thought Poster 5 was strange because a boy appeared to be 'throwing the phone up'. They also thought the spy emoji on Poster 2 was observing what people are doing.

Table 29: Poster preference of school B Year 3's group that received Poster 4.

Poster preference of the four children working with Poster 4				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
4	–	–	–	–

Six children composed the group working with Poster 5. Four of them wrote device safety suggestions before seeing the poster and only one of them repeated this advice in the Be Safe list. This child was the only one who made device safety recommendations in both tasks. The other children mentioned 'don't text and walk' or 'look where you are going' in the Be Safe list. One child wrote, 'always look up when crossing roads to see if there are any cars coming', suggesting people could text and walk provided that they 'looked up for cars'. The answers of this group in both written activities are shown in Table 30 below.

In the discussion with the researcher, the six children working with Poster 5 talked mostly about unrelated topics and briefly mentioned being careful about crossing roads and bumping into things. Regarding their poster preference, only one of them liked Poster1, four of them Poster 2, and one child Poster 4. While looking at all posters, they described what could be happening in Poster 1 and Poster 4, and one child said she/he did not understand what Poster 5 resembles. The children said that even Poster 2 resembles something: 'you can see a

Table 30: School B Year 3's written answers of the group that received Poster 5, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 3 – Poster 5		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	4	4
Avoidance actions	0	**2**
Consequences	2	**3**
Don't text and walk	0	**6**
Not suitable for children	0	0
Personal safety	0	**1**
Device safety	7	**0**
Undetermined	0	0
General advice	0	0

phone and [it] says don't text and walk, so you know you shouldn't text and walk'. Their poster preference is shown in Table 31.

Table 31: Poster preference of school B Year 3's group that received Poster 5.

Poster preference of the six children working with Poster 5				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
1	4	–	1	–

7.5.2 Junior school B's Year 6 results

The first and second stages were better controlled in Year 6 than in Year 3. Probably due to the children being older than in the previous class, they were not walking around during the study, so it is unlikely they saw other groups' posters. In this class, all parents had provided authorisation for their child to participate in the study, and most groups were composed of six children, except one group that had four children. Again, the groups were split based on children's sitting position in the classroom and not to achieve a mix of abilities. In contrast to the situation with Year 3, the conversation between the researcher and the groups of children in this class happened in a separate room with a table and chairs for everyone. A school staff member was present during the activity.

Overall, most children in Year 6 showed some prior knowledge of not texting and walking and no substantial difference was seen between the answers across posters. From the first to the second written task, specific references to 'don't text and walk' increased in all groups – from four similar sentences during the first stage to 29 during the second stage.

At the first stage, the answers of the six children who received Poster 1 were of two types: those that mentioned being careful about their surroundings (whether or not this related to roads) and those that mentioned device safety. During the second stage, while they were looking at the poster, all children wrote about looking where they were going, and road safety was a persistent topic, appearing in both written tasks. There were three mentions of 'don't text and walk' in the Be Safe list. These and the other responses are demonstrated in the following table, Table 32.

Table 32: School B Year 6's written answers of the group that received Poster 1, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 6 – Poster 1		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	3	**16**
Avoidance actions	0	**7**
Consequences	0	0
Don't text and walk	0	**3**
Not suitable for children	0	0
Personal safety	0	0
Device safety	3	**0**
Undetermined	2	**3**
General advice	0	**2**

In contrast to their Be Safe list, during the conversation with the researcher, the children working with Poster 1 made two references to the poster's drawing: they mentioned that people should not walk into anyone and should be aware of things on the pavement which someone could trip over. They also mentioned road safety issues while using the phone, and one child said that people could get lost if they were looking at the screen and not looking where they were going. In this group, five children preferred Poster 4 and one preferred Poster 2 (see Table 33). They said Poster 4 is more direct and realistic than the others. One child said Poster 4 shows what could happen, although this child was a little exaggerated in her opinion, to which another child replied that it was not exaggerated as she/he had already walked into a bin even without using a phone. One child said that Poster 1 also shows what could happen but that people are more likely to be in the situation in Poster 4 than in Poster 1, because 'there is not banana skin on the floor everywhere, but there are lampposts'. Another child reacted to this argument, saying that in Poster 1 the two situations could be compared (with and without a phone). One child preferred Poster 2, saying that this was just because she/he likes emojis. Another child said that the emojis are related to the phone, but said that she/he did not know what the picture meant in Poster 5. This group also thought that in Poster 5 someone had thrown the phone in the air, and said that it seems as if the children in the poster just walked and met rather than being on the phone – meaning the picture did not relate to the poster's topic.

Table 33: Poster preference of school B Year 6's group that received Poster 1.

Poster preference of the six children working with Poster 1				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
–	1	–	5	–

The four children who worked with Poster 2 showed good prior knowledge of the poster's topic. In the first task, all of them wrote about the risks involved when looking down at a phone and not paying attention to where they walk (whether or not this related to roads); some of them mentioned tripping over and walking into people. Only one child wrote about device safety in the first activity, which was not mentioned again in the second one. In the Be Safe list, all four children wrote that people should not text and walk. Considering these children's prior knowledge, not much change was noticed between their answers before and after seeing the poster. Some of the consequences of not

paying attention to their surroundings when using a mobile phone that were mentioned in the first task were not repeated in the second task, suggesting that the children may have become focused in their thinking on the poster's verbal information.

Table 34: School B Year 6's written answers of the group that received Poster 2, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 6 – Poster 2		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	4	**5**
Avoidance actions	0	**3**
Consequences	4	**0**
Don't text and walk	0	**4**
Not suitable for children	0	0
Personal safety	0	0
Device safety	2	**0**
Undetermined	0	**2**
General advice	0	0

This group of children started the third stage of the study by talking about dropping a phone or having it stolen. When talking about not texting and walking, most of them referred to road situations. Nonetheless, they also talked about bumping into people and tripping over. Two of the four children in this group preferred Poster 1 and the other two preferred Poster 4 (see Table 44). They said that Poster 4 shows what might happen and Poster 1 shows the difference between situations. They liked the speech balloons on Poster 2 that are similar to text messages, and the emojis on it – 'but' one child said, 'it's showing the phone features when [it] is telling you not to go on the phone'.

Table 35: Poster preference of school B Year 6's group that received Poster 2.

Poster preference of the four children working with Poster 2				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
2	–	–	2	–

Four of the six children in the group that received Poster 3 concentrated their answers to the first question on device safety. Two children in the group also mentioned bumping into things and looking where they were going; another two recommended being cautious of their surroundings. These answers suggest that these four children had some prior knowledge of the poster's topic. In the Be Safe list, although most of the device safety answers were not mentioned again in this second task, some other unrelated issues appeared, such as not listening to music while walking. One child focused his or her answers on personal and device safety. Nonetheless, four children wrote 'don't text and walk', to which some children added specific references to being near roads. All the answers given by this group are shown in Table 36 according to the families' groups.

The group of children that worked with Poster 3 initially talked about other phone issues (e.g. device safety, listening to music) in the discussion with the researcher. Two children said people should not text and walk and talked about the risks of doing so. One of these two said 'you could trip into something because like when you're walking over the road it might be a little pole or a "ditchy" thing if you're not

Table 36: School B Year 6's written answers of the group that received Poster 3, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 6 – Poster 3		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	6	**5**
Avoidance actions	0	0
Consequences	2	2
Don't text and walk	0	**7**
Not suitable for children	0	0
Personal safety	1	**4**
Device safety	7	**2**
Undetermined	0	**2**
General advice	0	0

paying attention', which somewhat describes Posters 1 and 4 and could imply that this child saw posters given to other groups. However, this contamination cannot be proven as other children in other groups had mentioned bumping into poles in the first task, prior to the presentation of the posters. In this group, one child preferred Poster 1, one preferred Poster 2, another two chose both Poster 4 and Poster 1 (in Table 37 0.5 is attributed to each choice of poster where a child chose two posters), and the last two liked Poster 5 best. The children who preferred Poster 5 said that everyone depicted in the poster looks happy because they are not on their phones and that therefore they are sociable, and added that 'if you're on your phone bad things can happen, but if you're with your friends they can help'. They also said that Poster 1 shows that when someone is not concentrating they could slip and break a leg.

Table 37: Poster preference of school B Year 6's group that received Poster 3.

Poster preference of the six children working with Poster 3				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
2	1	–	1	2

The six children working with Poster 4 also demonstrated prior knowledge about texting and walking. Three children wrote about the possible consequences of using a phone while walking, and four wrote about being careful of their surroundings. After receiving the poster, not much change could be seen in their answers that could be attributed to their previous knowledge. Only three children wrote the specific words 'don't text and walk'; the others wrote variations of them. Some of the advice regarding being distracted by the phone while on roads was more focused in the second written activity, where 'roads' was changed to 'while walking'. In the Be Safe list, a direct reference to the picture appeared, which was 'be careful of lamppost'. Another recommendation, 'walk slower so you have more time to react to things in front of you', was likely to have been an elaboration of the picture and was therefore considered a reference to it, as shown in Table 38.

In the discussion with the researcher, this group of children made references to road safety, some related to walking with a phone, and one completely unrelated to phones. One child listed a few objects on the pavement, including lampposts, that people on their phones should be aware of. In this group, four children chose Poster 1 as the best, one child preferred Poster 2, and one chose Poster 4 (see Table 51). When

Table 38: School B Year 6's written answers of the group that received Poster 4, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 6 – Poster 4		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	**2**
Take care advice	7	**8**
Avoidance actions	2	**3**
Consequences	3	3
Don't text and walk	3	**9**
Not suitable for children	0	0
Personal safety	0	**1**
Device safety	1	**0**
Undetermined	1	**0**
General advice	0	**1**

asked why they liked Poster 2, they said it somewhat shows the phone. They also said they liked the posters that show what could happen. Finally, according to this group, Poster 3 does not attract the reader because it just gives the message without pictures.

Table 39: Poster preference of school B Year 6's group that received Poster 4.

Poster preference of the six children working with Poster 4				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
4	1	–	1	–

The last group from school B Year 6 worked with Poster 5 and was composed of six children who showed some prior knowledge of the issue shown on the poster. In the first task, three children wrote about device safety and wrote sentences that mean 'don't text and walk'. The other three recommended being aware of their surroundings, and one of these children also specified the consequences of texting and walking. In the second written activity, again three children mentioned 'don't text and walk', this time with these exact words, and a fourth child wrote '[don't] play on your phone'. This group's Be Safe list had more recommendations about personal and road safety than were included in their first written task, as shown in the following table, Table 40.

Table 40: School B Year 6's written answers of the group that received Poster 5, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School B Year 6 – Poster 5		
Type of advice	**Task 1**	**Task 2**
Drawing references	n/a	0
Take care advice	3	**8**
Avoidance actions	1	1
Consequences	2	**0**
Don't text and walk	2	**6**
Not suitable for children	0	0
Personal safety	0	**6**
Device safety	2	**0**
Undetermined	0	**8**
General advice	0	**1**

Finally, in the discussion with the researcher, two children in this group said that people need to look up occasionally when walking with a phone, as if it was acceptable to text and walk if a person looked up from time to time. Children also mentioned other road safety issues, some of them related to phones (e.g. listening to music, don't stop in the

middle of the road to text or call) and others unrelated (e.g. stopping at traffic lights, don't run on roads). They did not focus much on the risks of texting and walking. One of the six children in this group preferred Poster 2 and the other five preferred Poster 4 (see Table 41). They said they would have chosen Poster 1 as well, but Poster 4 showed the road and the picture was connected with the poster topic. They thought Poster 1 was showing a school environment and children are not allowed take phones to school. Also, they said it is difficult to slip on a banana peel. Poster 4, according to them, is straight to the point and Poster 5 seems to be 'sugar-coating' the topic. Finally, they said that Poster 2 shows texting features (emojis) but it is advising not to text.

Table 41: Poster preference of school B Year 6's group that received Poster 5.

Poster preference of the six children working with Poster 5				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
–	1	–	5	–

7.5.3 Junior school B's study discussion

Comparing children's initial answers in the first written task to the answers given in the second written task, which they completed after receiving the posters, no significant difference was noticed between school years and across posters. The number of answers in Table 42 below, regarding the second written task only, suggests that all posters inspired answers related to the poster's topic in children of both age groups, slightly more for some than for others. Noticeably, take care advice and repetition of the words don't text and walk or similar were the most commonly written answers across all conditions.

Table 42: Comparison of school B's children's answers in the second written task, divided into poster groups and the two school years participating in the study. Number of answers divided by number of participants in each group (i.e. n=x/y, where x is number of answers, y is number of children in the group, and n is the result of this division rounded up), organised from high relation with the poster's topic (top) to low relation with the poster (bottom). See raw table in Appendix 3.

Number of children's answers to the second written task at school B										
Type of Advice	**Poster 1**		**Poster 2**		**Poster 3**		**Poster 4**		**Poster 5**	
	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6
Drawing references	1	0	0	0	0	0	1	0	0	0
Take care advice	2	3	3	1	1	1	1	1	1	1
Avoidance actions	0	1	1	1	0	0	1	1	0	0
Consequences	0	0	0	0	0	0	1	1	1	0
Don't text and walk	1	1	2	1	1	1	1	1	1	1
Not suitable for children	0	0	1	0	0	0	0	0	0	0
Personal safety	0	0	0	0	0	1	0	0	0	1
Device safety	0	0	0	0	0	1	0	0	0	0
Undetermined	0	2	0	1	0	0	0	0	0	1
General advice	0	0	0	0	0	0	0	0	0	0

Although comparing the number of answers across the age groups would normally allow identification of some tendencies in children's responses to posters in a quantitative way, in this study some factors hindered this possibility. The number of children in the groups from each school year was too disparate to be compared; hence the answers were divided by the number of children, as shown in Table 42 above. Furthermore, children's specific answers and the discussion between the children and the researcher provide a better view of the tendencies than the quantitative approach. Still, Table 42 provides good guidance when starting to look at the similarities and differences.

Children's responses to Poster 1 show a mix of trends by age groups. On one hand, the younger children who received this poster seemed to be more susceptible to distraction from visual information than the older children, as they wrote and talked about the littering problem depicted in the drawing. On the other hand, the older children working with this poster did not write about this issue but mentioned it in the discussion with the researcher, as did another group of Year 6 children when they looked at all of the posters together. Despite Poster 1's distracting visual features, all children working with it also wrote that people should not text and walk, which suggested an understanding of the poster's topic. Nonetheless, among the correct advice, the appearance of advice suggesting that people should not text and *drive* in Year 3's answers suggested a disconnection between the children and the poster's topic. The older children working with Poster 1 wrote the higher number of take care actions among all groups in their Be Safe list, mostly recommending that people look where they are going, which is likely to have been prompted by the scene depicted in the poster's drawing.

Poster 4 provided more accurate information to all of the children without the distracting features of Poster 1. Although the Be Safe lists of the younger children working with this poster suggested that the poster is effective, their discussion with the researcher suggested otherwise, as they mostly talked about other unrelated issues.

It was possible that one child who worked with Poster 3 suffered contamination by seeing Posters 1 and 4, and this could have influenced that child's answers. If this is true, it is interesting to observe that possibly by looking at other posters the child identified the pictorial features mentioned in her answers (i.e. pole and 'ditchy thing') and linked them with the poster's topic, suggesting the efficiency of those pictures.

An important feature of this study that did not appear in the initial study was the attempt of some children from both age groups to attribute meaning to the decorative pictures. Poster 2 elicited two different responses: the children in Year 6 thought the phone and the emojis represented a connection with the poster's topic, although some thought it contradictory because it shows phone features while advising not use a phone; most of the children from Year 3 said that this poster tells you what to do. Interestingly, some of the same children said that Poster 5 does not mean anything, even though it contains the same verbal information that 'tells what to do' as Poster 2. These results suggested that the younger children liked the emojis but could not rationally justify their preference. Thus, they said that Poster 2 tells people what to do, whereas the older children linked the emojis to the poster's topic. Despite different children's attempts to make sense of the picture, it seems that the younger children working with this poster understood its central message.

The younger children's inability to make the connection between the emojis and the poster that the older children made could be due to the different level of cognitive development they were at but could also relate to the fact that the younger children seemed slightly less connected to the posters' topic than the older children. This was perceived in

some children's written answers, such as 'texting and *driving',* which is directed at adults, and '*playing* and walking', which does not necessarily include texting. Such recommendations appeared in the Be Safe lists of the groups working with Posters 1, 2, and 3; the first one transmits distracting information, and the last two do not depict children or the situation being highlighted, which could be the reason for the reduced connection of these groups with the focal message of the poster compared with the level of this connection in other groups.

When they were trying to make sense of the pictures, some children thought that Poster 5 depicts a group of friends that are playing together. The younger children thought that this scenario had no relation to the poster's topic, whereas most of the older children said that the characters are happy because they are playing with each other, rather than on the phone, and that the poster shows the correct attitude.

There were many off-topic answers in the Be Safe lists of the older children working with Poster 5 and in the lists of both age groups that saw this poster during their conversations with the researcher. The younger children did not mention texting and walking in the discussion with the researcher. The older children talked about texting and walking as if it was not too dangerous, which suggested that the absence of these risks in Poster 5's picture could have reduced the children's perceptions of the risks of texting and walking.

Lastly, most children working with Poster 3 repeated its central message. The groups that received this poster were not excited by it, though, and some children did not pay much attention to it. Finally, when all groups were asked about their preference, the unanimous response was that they thought Poster 3 was tedious.

Poster preference

Table 43 and Table 44 show the children's poster preferences across the age groups. Regarding the two informative posters, although the younger children preferred Poster 1 slightly more than Poster 4, combining the two age groups, Poster 4 was chosen as the preferred option most often. The high preference for Poster 4 was supported by the children's Be Safe lists, which showed that this poster prompted a great number of accurate responses in both age groups. Nonetheless, out of the 21 children who preferred this poster, 15 belonged to Year 6 (2 of whom chose two posters). This pattern in choice could be explained by the analytical view of these children when observing the posters. Their comments suggested that they thought Poster 4 was more direct and objective than the others. Although many of the younger children thought similarly, they split their preference between the two posters with informative pictures. The higher preference for the two posters with informative pictures in both age groups plus the fact that two children from Year 6 chose the two posters with informative pictures highlights the potential effectiveness of narrative posters.

In regard to the decorative pictures posters, and proportionally to the number of participants from each age group, a greater proportion of the younger children than the older children chose Poster 2. The two

Table 43: School B Year 3 children's preference for posters.

	Poster preferences				
Groups identified by the poster presented initially	**1** *(informative picture A)*	**2** *(decorative picture A)*	**3** *(no picture)*	**4** *(informative picture B)*	**5** *(decorative picture B)*
1: Informative picture A *(n=2)*	2	0	0	0	0
2: Decorative picture A *(n=2)*	2	0	0	0	0
3: No picture *(n=8)*	2	0	0	1	0
4: Informative picture B *(n=4)*	0	0	0	4	0
5: Decorative picture B *(n=6)*	1	4	0	1	0
Year 3 class *(n=17)*	**7**	**4**	**–**	**6**	**–**

Table 44: School B Year 6 children's preference for posters; when children preferred two posters, 0.5 was attributed to each choice.

	Poster preferences				
Groups identified by the poster presented initially	**1** *(informative picture A)*	**2** *(decorative picture A)*	**3** *(no picture)*	**4** *(informative picture B)*	**5** *(decorative picture B)*
1: Informative picture A (n=6)	0	1	0	5	0
2: Decorative picture A (n=4)	2	0	0	2	0
3: No picture (n=6)	2	1	0	1	2
4: Informative picture B (n=6)	4	1	0	1	0
5: Decorative picture B (n=6)	0	1	0	5	0
Year 6 class (n=28)	**8**	**4**	**–**	**14**	**2**

children in Year 6 who chose Poster 5 attributed meaning to the drawing, connecting it to the poster's message. In contrast, no children from Year 3 preferred Poster 5, reflecting their comments that they did not understand the reason for its picture. Interestingly, the Be Safe list of the younger children working with this poster was more accurate than the list of those from Year 6 also working with this poster, who tended to write off-topic advice.

After examining the children's comments and poster preferences, it is possible to say that the children from Year 3 were somewhat driven by the posters' physical features, such as the emojis in Poster 2 and the colours that were more diverse in both Posters 1 and 2 than in Poster 4. On the other hand, the older children seem to have thought about the clarity and objectiveness of the posters' message across both verbal and pictorial information. Although these assumptions cannot be confirmed just from looking at the data, they are in accordance with children's developmental stages, as already described in the first study at school A (Chapter 6) and discussed earlier in Chapter 5. Younger children tend to focus on what is interesting to them whereas older children can explore a range of possibilities prompted by a stimulus. In contrast to the previous study, where the poster preference was also reflected in the children's Be Safe list, here there was no evidence of a connection between the two.

Study limitations

- Disparate number of participants in Year 3's groups: not identifying which children had parents' consent prior to the study involving children from Year 3 resulted in very different numbers of children in each group, making difficult the comparison between groups

within that year and across the age groups.

• Younger children were more dispersed: similarly to the school A, the children from Year 3 were more mobile and dispersed than those in Year 6, possibly allowing those children to see other posters. Despite the possible contamination, this could be typical behaviour in schools, and potential distraction should be taken into account when designing H&S information for this age group.

• Study environment was not consistent: similar to the school A, the different environments where the conversation with the researcher took place – an open area for Year 3 and a room with a table and chairs for Year 6 – could have influenced the children's discussions.

The same study was replicated at a different school and is discussed next, followed by a discussion of the results of the studies done at the two schools.

7.6 Study at junior school C

Similarly to at school B and differently from the first study at school A, the division of the children from both Year 3 and Year 6 into groups was based on children's sitting position in the classroom and not on their abilities.

7.6.1 Junior school C's Year 3 results

There were two classes of Year 3 children at school C, from which around half of the children had returned the parents' permission form for the study. Thus, the children who could participate were moved to a separate classroom where there were fewer tables than children, and some of them did not have chairs to sit on so worked on the floor. The room layout was not ideal because it allowed children to walk around and made it possible for some of them to see other groups' posters. The discussion with the researcher happened in an informal area with a small table and not enough chairs for all of the children. During the study, some children were asked to leave to be part of another activity with teachers, and thus in some groups the number of children changed from one study stage to another.

Overall, no clear differences between posters were observed in the second written activity compared to the first. The children's answers were tabulated following the same procedures used for the study at school B: the children's written safety recommendations were classified into the family groups, and repeated written answers by the same child were combined as one.

The seven children working with Poster 1 showed some familiarity with the poster's topic before seeing it. In the first task these children wrote 'take care' advice and the consequences of texting and walking. They also wrote about device safety and personal safety more often than about the related issues, as demonstrated in Table 45. Later, in the Be Safe list, the noting of off-topic issues decreased and advice in relation to the poster's topic increased – all six children wrote that a person should not text and walk, one child saying that texting should not be done while

on a road. Two recommendations these children wrote could be linked to pictorial information in the poster. The first was a direct reference to the drawing: 'look out for people, slippery stuff and puddles'; the second indirectly related to the picture as it said 'do watch what other people are doing'.

Table 45: School C Year 3's written answers of the group that received Poster 1, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 3 – Poster 1		
Type of advice	**Task 1** 7 children	**Task 2** 6 children
Drawing references	**n/a**	**2**
Take care advice	4	4
Avoidance actions	**0**	**2**
Consequences	**2**	**0**
Don't text and walk	**1**	**6**
Not suitable for children	0	0
Personal safety	**3**	**0**
Device safety	**5**	**1**
Undetermined	**1**	**5**
General advice	1	1

Reinforcing their references to the picture in their Be Safe list, this group focused on the poster's pictorial information in the discussion with the researcher. They linked pictorial features (e.g. look for puddles and banana skins, be aware of other people) to 'when using a phone', although they did not directly advise not to text and walk. Five children from this group preferred Poster 2 because it 'looks cool, looks fun'; one child chose Poster 1, and one chose Poster 5 (Table 46). They thought Poster 3 was boring and that Poster 5 shows what people should do, i.e. not be on their phones.

Table 46: Poster preference school C Year 3's group that received Poster 1.

Poster preference of the seven children working with Poster 1				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
1	5	-	-	1

Seven of the eight children working with Poster 2 answered the first question with at least one recommendation each to take care when walking with a phone. Their other responses were about device safety and one rather unrealistic situation (dropping the phone and it calling someone not very nice). After receiving the poster, they concentrated their answers around the poster's verbal information (i.e. 'don't text and walk' and 'look out'), either literally or slightly varying it. One child suggested 'don't chat with people you don't know', referring to online chat, which could have related to the emojis in this poster. All the answers given by this group can be seen in Table 47.

In the discussion with the researcher, this group started by saying that people should look where they are going, and then moved to road safety recommendations. They also repeated the unrealistic idea about dropping the phone from the Be Safe list. One child decided not to give his/ her poster preference; among the others, five children preferred Poster 1, one child chose Poster 2, and another Poster 4. This group got too excited by talking about other topics and did not comment much on each poster.

Table 47: School C Year 3's written answers of the group that received Poster 2, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 3 – Poster 2		
Type of advice	**Task 1** 8 children	**Task 2** 8 children
Drawing references	n/a	0
Take care advice	6	6
Avoidance actions	0	0
Consequences	3	**1**
Don't text and walk	1	**8**
Not suitable for children	0	1
Personal safety	1	**2**
Device safety	16	**0**
Undetermined	0	**3**
General advice	0	0

Table 48: Poster preference of school C Year 3's group that received Poster 2.

Poster preference of the eight children working with Poster 2				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
5	1	-	1	-

In the group that looked at Poster 3, during the first stage five of the eight children wrote advice related to being careful or about using the phone on roads. Two children wrote about device safety issues. Children working with this poster wrote about a variety of topics during the second stage, as shown in Table 49. Some recommendations were related to the poster's information ('don't text and walk'), others deviated from the topic, such as suggesting avoiding using the phone, and some gave completely unrelated advice ('if you're walking your dog keep your eyes on the dog'). Curiously, there was a particular mention of walking into a lamppost, which could have indicated that someone in this group had seen Poster 4. Despite the unrelated answers, all eight children repeated at least one aspect of the verbal information shown on the poster.

Table 49: School C Year 3's written answers of the group that received Poster 3, highlighting (colour and bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 3 – Poster 3		
Type of advice	**Task 1** 8 children	**Task 2** 8 children
Drawing references	n/a	0
Take care advice	3	4
Avoidance actions	0	6
Consequences	4	**4**
Don't text and walk	1	**7**
Not suitable for children	0	**1**
Personal safety	0	**2**
Device safety	3	**0**
Undetermined	0	**5**
General advice	0	0

Corroborating their Be Safe list, during the third stage this group of children talked about a variety of reasons why a phone should not be used while walking, not all of them related to the poster's theme. Nonetheless, they also said that people should look where they are going, mentioned the risk of walking into a lamppost, and suggested only using a phone in an emergency. Five children from this group preferred Poster 1, one chose Poster 2, and three preferred Poster 4. There was a total

of nine votes because one child chose Poster 1 and Poster 4 as equally good, as seen in Table 50, where 0.5 is attributed to this each of this child's votes.

Table 50: Poster preference of School C Year 3's group that received Poster 3.

Poster preference of the eight children working with Poster 3				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
4.5	1	-	2.5	-

From the seven children working with Poster 4, only three wrote advice somewhat related to the poster's topic when answering the baseline question; all of them wrote about device safety, indicating low familiarity with the poster's topic. After receiving the poster, no children mentioned device safety again, and all of them recommended not texting and walking, which was the most common answer given in this group. One child provided one entirely unrelated recommendation among her list of related advice. This group's answers are classified in Table 51 below.

Table 51: School C Year 3's written answers of the group that received Poster 4, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 3 – Poster 4		
Type of advice	**Task 1** 7 children	**Task 2** 7 children
Drawing references	n/a	0
Take care advice	3	**4**
Avoidance actions	0	**6**
Consequences	4	4
Don't text and walk	1	**7**
Not suitable for children	0	**1**
Personal safety	0	**2**
Device safety	3	**0**
Undetermined	0	**5**
General advice	0	**1**

During the discussion with the researcher, these children talked mostly about walking into things or people, reinforcing their Be Safe lists, although one child also mentioned texting and driving. One child talked specifically about bumping their head, possibly referring to the depiction of a boy about to hit his head on the lamppost in the poster she/he initially saw. When they looked at all five posters, most of them were enthusiastic about the emojis in Poster 2; nevertheless, one child said she/he liked emojis but thought Poster 1 is the best because it shows the difference between being able to see the path or being distracted on the phone. In the end, Poster 1 and Poster 2 were each chosen by three children; the seventh child preferred Poster 5 because she/he thought the children in it are among friends.

Table 52: Poster preference of School C Year 3's group that received Poster 4.

Poster preference of the seven children working with Poster 4				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
3	3	–	–	1

All seven children in the group that worked with Poster 5 advised being careful when walking with a phone in the first written activity, mostly referring to doing it on roads. After receiving their poster, six children wrote in their Be Safe list that people should not text and walk,

and one child wrote 'not to *play* and walk'. Many of this group's answers were about road safety rules, some of which, such as 'look at traffic lights', could have been a reminder to look at traffic when using a mobile, but also might not have been; others had no relation to phones, such as 'hold hands while you're crossing'. All the answers given by this group are tabulated in Table 53 below.

Table 53: School C Year 3's written answers of the group that received Poster 5, highlighting (bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 3 – Poster 5		
Type of advice	**Task 1** 7 children	**Task 2** 7 children
Drawing references	n/a	0
Take care advice	8	**8**
Avoidance actions	0	**4**
Consequences	3	3
Don't text and walk	0	**8**
Not suitable for children	0	0
Personal safety	0	**1**
Device safety	5	**0**
Undetermined	2	**3**
General advice	0	**4**

Only five children from the seven who initially formed this group participated in the discussion with the researcher. They talked about a variety of risks when using a phone; some were very specific but are not part of everyday life for most people (e.g. don't go on construction sites when looking down at the phone), and others were somewhat unrealistic (e.g. breaking the phone and cutting their ear). They also talked about walking into people or animals and getting run over by cars and, finally, about looking where they are going. When looking at all five posters, these children thought Poster 3 is boring; Poster 1 is funny and shows that people may slip over if they are looking at their phone; and Poster 4 shows that people may hit their head. Additionally, they were enthusiastic about the emojis on Poster 2. They spent some time talking about Poster 5 and how it shows what people should be doing and how life is more interesting if people are not on their phones because they can see the world around them. Some of them also thought that if someone is on their phone and they get frightened, they could throw their phone in the air – referring to the poster's drawing. Although they tried making sense of the picture in Poster 5, only one of them actually chose it as the best one; three preferred Poster 1, and the fifth child chose Poster 2.

Table 54: Poster preference of School C Year 3's group that received Poster 5.

Poster preference of the five children working with Poster 5				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
3	1	–	–	1

7.6.2 Junior school C's Year 6 results

In the classroom that was used for this study, the children remained seated in the positions they were in prior to the study. The room layout was not ideal so in some cases children saw posters being presented to other groups. Additionally, the discussions with the researcher were interrupted by other activities taking place in the vicinity of the groups.

In the first task, most children in all groups wrote about device

safety, which decreased substantially in the second task, although other phone issues and answers whose meaning could not be determined appeared. There was a slight difference in the answers given by the group working with Poster 1 and the other groups. This poster seemed to have transmitted the message more accurately while the other posters elicited more varied responses.

Three children working with Poster 1 answered the baseline question with take care advice, and two others mentioned the consequences of looking at the phone when walking. Device safety was also mentioned in this first task. Once they had received the poster, only four of the five children in this group continued the study. In the Be Safe list, device safety was not mentioned again and all four children recommended not texting and walking – which had not been said during the first written activity. Also new during the second stage was the suggestion of avoiding using the phone. One child specifically recommended not slipping on a banana peel or in a puddle, which related to the drawing on the poster, whereas the other three children advised not tripping over or slipping on 'something'. The first child also recommended not walking into a wall. All the answers given by this group during the two written activities are classified in Table 55.

Table 55: School C Year 6's written answers of the group that received Poster 1, highlighting (colour and bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 6 – Poster 1		
Type of advice	**Task 1** 5 children	**Task 2** 4 children
Drawing references	n/a	**4**
Take care advice	5	**6**
Avoidance actions	0	**4**
Consequences	4	**1 (4)**
Don't text and walk	0	**4**
Not suitable for children	0	0
Personal safety	0	0
Device safety	4	**0**
Undetermined	0	0
General advice	0	0

During the conversation with the researcher, this group mostly talked about paying attention to the surroundings, on roads and in general. They mentioned the risks of not paying attention and walking into a car, getting run over, slipping on something, or walking off a cliff. Besides this relevant advice, they also talked about other phone issues not related to the poster's topic. When they looked at all five posters, three of the four children preferred Poster 2, and one of these three said she/he also liked Poster 1 and Poster 4 because they tell us about the surroundings and why people cannot text. The fourth child chose Poster 1 because it shows what happens and compares the two situations. They all thought Posters 1 and 4 are instructive, but those who still preferred Poster 2 did so because, according to them, emojis are eye-catching and 'are the thing these days'.

All five children who received Poster 2 answered the first written question with recommendations to be careful on roads when using a phone. Four of them also wrote advice about other off-topic issues

Table 56: Poster preference of school C Year 6's group that received Poster 1.

Poster preference of the four children working with Poster 1				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
1	3	–	–	–

related to phones (e.g. taking earphones out). During the second stage, all children wrote 'don't text and walk' on roads and also in general, i.e. not specifying where. Three children again mentioned being careful, but this time they were less focused on road safety; and two other children suggested avoiding using the phone, as demonstrated in Table 57 below.

Table 57: School C Year 6's written answers of the group that received Poster 2, highlighting (colour and bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 6 – Poster 2		
Type of advice	**Task 1** 5 children	**Task 2** 5 children
Drawing references	n/a	0
Take care advice	11	11
Avoidance actions	0	**4**
Consequences	3	**0**
Don't text and walk	0	**6**
Not suitable for children	0	0
Personal safety	4	3
Device safety	1	**0**
Undetermined	0	**1**
General advice	0	0

Similarly to the previous group, the children working with Poster 2 started the conversation with the researcher by talking about their surroundings on roads while using the phone. One of them mentioned using earphones, and another said that if people do not pay attention they could be kidnapped. Hitting people while using a phone was also mentioned, with discussion of the danger involved if the other person is old because they could be hurt. When looking at the five posters, they considered Poster 2, which includes emojis, to be more fun and said children like them. They also said that this poster is bold and helps both children, who would pay more attention to it because of the emojis, and adults. They described the scenes on Posters 1 and 4, showing they understood them. One child did not understand Poster 5 and thought the boy in the drawing is throwing his phone in the air. Four children from this group chose Poster 2 and one child preferred Poster 4.

Table 58: Poster preference of school C Year 6's group that received Poster 2.

Poster preference of the five children working with Poster 2				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
–	4	–	1	–

In response to the baseline question, the five children who received Poster 3 mostly wrote about being careful when walking with a phone, as shown in Table 59. Some of them cited obstacles of which people should be aware and all of them were related to roads (e.g. cars, roadworks, bus stops) and the outdoors (e.g. lakes, walking near water). In the Be Safe lists, all children in this group recommended being careful when using a phone, always relating it to road safety. Some answers were so focused on road safety that it was difficult to tell whether they referred to the phone or just road safety in general (e.g. 'only cross the road at zebra crossing'). Moreover, four children wrote 'don't text and

walk while crossing the road'. Two children advised simply 'don't text and walk', and one of them made suggestions about actions to be taken on the road.

Table 59: School C Year 6's written answers of the group that received Poster 3, highlighting (colour and bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 6 – Poster 3		
Type of advice	**Task 1** 5 children	**Task 2** 5 children
Drawing references	n/a	**0**
Take care advice	12	**7**
Avoidance actions	0	**3**
Consequences	2	**0**
Don't text and walk	0	**6**
Not suitable for children	0	0
Personal safety	0	0
Device safety	0	**0**
Undetermined	1	**3**
General advice	0	0

Similarly to the two previous groups, the children who worked with Poster 3 initiated the conversation with the researcher by discussing road safety while using the phone. However, whereas the previous groups also mentioned other situations, such as slipping or walking into people, this group focused solely on road safety. The poster preference was divided between Poster 1, which was chosen by one child, Poster 2, chosen by two children, and Poster 4, also chosen by two children (see Table 60). One child impulsively said she/he liked Poster 5 and then looked at it intently, reading it properly, and changed his mind because, according to him, the boy in the drawing is throwing the phone in the air. One child liked the banana skin on the floor in Poster 1, another said she/he liked Poster 2 because it has emojis on it, and a third child preferred Poster 4 over Poster 1 because people hurt themselves more if they walk into a pole than into a person.

Table 60: Poster preference of school C Year 6's group that received Poster 3.

Poster preference of the five children working with Poster 3				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
1	2	–	2	–

The six children who received Poster 4, similarly to the children in the previous two groups, concentrated their answers to the first question on being careful when using the phone on roads. Two children also mentioned device safety, and four of the six children also talked about not wearing earphones. After seeing the poster, this group focused their Be Safe lists on being aware of their surroundings. Nonetheless, they also wrote advice unrelated to the poster's theme and that was not mentioned in the previous activity, for example advice relating to internet and personal information safety, and other unrelated topics (e.g. 'don't accept food from strangers'). Still, all children in this group recommended not texting and walking, although only two of them focused exclusively on this issue. One child mentioned the possibility of hitting a tree – some children thought the pole depicted in the poster picture is a tree. All of the answers given by this group in the two written activities are classified in Table 61 below.

Table 61: School C Year 6's written answers of the group that received Poster 4, highlighting (colour and bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 6 – Poster 3		
Type of advice	**Task 1** 6 children	**Task 2** 6 children
Drawing references	n/a	**1**
Take care advice	11	**12**
Avoidance actions	0	0
Consequences	3	**0 (1)**
Don't text and walk	0	**7**
Not suitable for children	0	0
Personal safety	5	4
Device safety	4	**0**
Undetermined	1	**2**
General advice	0	**2**

In the discussion with the researcher, most of these children talked about being careful. In contrast to the children in other groups in Year 6, these children did not relate only to taking care on roads but when walking with a phone anywhere as well. One child made an unrelated recommendation relating to 'waving a phone' to appearing to be rich. Four children from this group preferred Poster 1 and Poster 2 equally, and two of these four also liked Poster 4. One child chose Poster 5, as shown in Table 58. They were confused about whether Poster 4 depicts a lamppost or a tree because what is depicted in the poster is green; one child said it was a signpost. Talking about Poster 5, they thought everyone in the drawing looks happy. Three of the children stated that they liked the emojis in Poster 2. Poster 1 is funny, according to them, because they can see that the girl is observant and boy is not; one child added that they could see the difference between using a phone and not using it.

Table 62: Poster preference of school C Year 6's group that received Poster 4.

Poster preference of the six children working with Poster 4				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
2	2	–	–	1

Five children worked with Poster 5, and three of them answered the first question with answers about the possible consequences of texting and walking, such as walking into people; the other two advised not crossing the road when looking at a phone. Device safety advice was also recurrent, with four children mentioning it. After receiving the poster, all of them wrote that people should not text and walk, and three of them also recommended not doing it on roads. Three unrelated issues also appeared in their answers, and two children advised not texting and driving. The distribution of answers according to the families' groups is shown in Table 63.

In the discussion with the researcher, the children in this group said that they should be aware of people around them; however, one of them said that people around them might be thieves. Two children talked about the risks of using earphones while on the road. Road safety was also discussed, and one child mentioned the possibility of having an accident while crossing the road. All six children from this group preferred Poster 2 (see Table 64). One said that she/he did not understand Poster 5, other children said that Poster 3 is boring but that

Table 63: School C Year 6's written answers of the group that received Poster 5, highlighting (colour and bold) the difference in the answers between before seeing the poster (written task 1 – Baseline question) and when working with it (written task 2 – Be Safe list). Answers are organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

School C Year 6 – Poster 5		
Type of advice	**Task 1** 5 children	**Task 2** 6 children
Drawing references	n/a	**0**
Take care advice	6	6
Avoidance actions	1	**3**
Consequences	3	**0**
Don't text and walk	0	**10**
Not suitable for children	0	**3**
Personal safety	0	0
Device safety	5	**4**
Undetermined	0	**1**
General advice	0	2

Poster 2 catches your attention: 'if you see it you'd lift your eye to look at it'. They said that Poster 4 was their second favourite and Poster 1 their third.

Table 64: Poster preference of school C Year 6's group that received Poster 5.

Poster preference of the five children working with Poster 5				
Poster 1	**Poster 2**	**Poster 3**	**Poster 4**	**Poster 5**
–	6	–	–	–

7.6.3 Junior school C's study discussion

Table 65: Comparison of school C's children's answers in the second written task, divided into poster groups and the two school years participating in the study. Number of answers divided by number of participants in each group (i.e. n=x/y, where x is number of answers, y is number of children in the group, and n is the result of this division rounded up), organised from high relation with the poster's topic (top) to low relation with the poster (bottom). See raw table in Appendix 3.

The numbers of children's answers to the questions in the two written tasks, similarly to the study at school B, showed minor differences between school years and across posters. Table 65 shows the answers in regard to the second written task only. Poster 1 seemed to have been slightly more efficient than the other posters for children from Year 6 and across the age groups. The older children working with this poster focused their answers on the poster's topic and did not write any unrelated advice.

Number of children's answers to the second written task at School C

Type of Advice	**Poster 1**		**Poster 2**		**Poster 3**		**Poster 4**		**Poster 5**	
	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6
Drawing references	0	1	0	0	0	0	0	0	0	0
Take care advice	1	2	1	2	1	1	1	2	1	1
Avoidance actions	0	1	0	1	1	0	0	0	1	1
Consequences	0	0	1	0	0	0	0	0	0	0
Don't text and walk	1	1	1	1	1	1	1	1	1	2
Not suitable for children	0	0	1	0	1	0	0	0	0	1
Personal safety	0	0	0	1	0	0	0	1	0	0
Device safety	0	0	0	0	0	0	0	0	0	1
Undetermined	1	0	0	0	1	1	0	0	0	0
General advice	0	0	0	0	1	0	0	0	1	0

Although the numbers in the table above suggest some tendencies in the children's response to the posters, for this study a qualitative view is more appropriate. Thus, looking at the content of each written answer in combination with the discussions with the researcher provides more

nuances regarding the children's understanding of and response to the posters than the number of responses alone.

In this school, the informative pictures elicited answers that were more focused on the posters' topic than the decorative pictures. Children from Year 6 were more restricted to the pictorial features of Poster 1 (citing banana skins and puddles), while Year 3 children were more general when talking about the poster's topic. For both age groups, this drawing seemed to have reinforced the verbal information, since they mentioned specific and general advice that was likely to have been prompted by it (e.g. look at your surroundings) and that was all related to the poster's topic.

Overall, children working with Poster 4 improved their answers between tasks. Nonetheless, the perceptible influence of the informative pictures in the answers was less evident regarding the children working with Poster 4 than for those working with Poster 1. Moreover, the younger children working with Poster 4 presented more topic-relevant answers after seeing the poster than the same group from Year 6, which had already shown awareness about the risks of texting and walking in the first written task.

The posters with decorative pictures were more open to interpretation, which can be a problem when communicating precise H&S information. The children working with Posters 2 and 5 talked about other issues not necessarily related to the central message, although the verbal information seemed to have been communicated properly. The group from Year 3 working with Poster 2 and Poster 5, for instance, mentioned a few fanciful ideas about phones that could have emerged because younger children are likely to be less familiar with texting and walking than older children. Additionally, the decorative pictures did not depict the risks of such activity.

Poster 5 elicited a variety of topics in both written and oral activities. The younger children who were given this poster focused their answers on road safety and tried making sense of the picture in it. They said it depicts the correct behaviour, whereas most of the older children did not understand Poster 5.

Despite some children's somewhat unrealistic answers, no children in this school tried attributing meaning to the emojis in Poster 2. Most of them said they liked this poster because they enjoy emojis, suggesting that for them a picture for which they have affection can be more important than a picture that an informative picture that they do not like. Additionally, the accuracy of the wording in the topic-related answers by the younger children who initially received Poster 2 suggested that they paid attention to the poster – perhaps attracted by the emojis – leading them to read the information in it and to repeat it.

Poster 3 also elicited some accurate answers in both age groups; however, the children had already shown some familiarity with the topic in the first task. Year 6 seemed to have benefited more from this poster than the younger children, who, despite giving a few accurate answers, also wrote about a variety of other topics. Still, the older children

mostly recommended not texting and walking on roads. Comparing the answers of the two groups working with Poster 3 with the other groups, it seemed that the lack of pictorial information was reflected in a lack of focus in children's answers. This happened in both written tasks and discussions, where the older children mainly focused on road safety.

Poster preference

The two tables below (Table 66 and Table 67) show that the younger children's preference for Poster 1 is higher than their preference for the other posters. It was also higher than the older children's preference for it. Interestingly, the children in Year 3 who chose this poster were from the groups that did not work with it initially. Among the children who were given Poster 1 initially, only one chose it as the best; the others chose Poster 2, which was the second best for the younger children and the most preferred by the older children. The high preference for Posters 1 and 2 in both age groups was somewhat corroborated by their understanding of the posters, discussed in the section above. In this sense, although Poster 4 seemed to have been efficient for both age groups, it was not chosen as much as the other two. Some groups from Year 6 that had criticised the lack of realism in the scene depicted in Poster 1 thought the situation depicted in Poster 4 was more likely to happen than the situation depicted in Poster 1.

Table 66: School C Year 3 children's preference for posters.

	Poster preferences				
Groups identified by the poster presented initially	**1** *(informative picture A)*	**2** *(decorative picture A)*	**3** *(no picture)*	**4** *(informative picture B)*	**5** *(decorative picture B)*
1: Informative picture A *(n=2)*	1	5	0	0	1
2: Decorative picture A *(n=2)*	5	1	0	1	0
3: No picture *(n=8)*	5	1	0	3	0
4: Informative picture B *(n=4)*	3	3	0	0	1
5: Decorative picture B *(n=6)*	3	1	0	0	1
Year 3 class *(n=17)*	**17**	**11**	**-**	**3**	**3**

Table 67: School C Year 6 children's preference for posters; when children preferred two posters 0.5 was attributed to each choice.

	Poster preferences				
Groups identified by the poster presented initially	**1** *(informative picture A)*	**2** *(decorative picture A)*	**3** *(no picture)*	**4** *(informative picture B)*	**5** *(decorative picture B)*
1: Informative picture A *(n=4)*	1	3	0	0	0
2: Decorative picture A *(n=4)*	0	3	0	1	0
3: No picture *(n=5)*	1	2	0	2	0
4: Informative picture B *(n=5)*	2	2	0	0	1
5: Decorative picture B *(n=6)*	0	6	0	0	0
Year 3 class *(n=24)*	**4**	**16**	**-**	**3**	**1**

Poster 5 was preferred by four children who thought that it depicts what people should do (i.e. not be on their phones) and that the characters in the posters look happy because they are not on the phone. Nonetheless, as pointed out earlier, one child impulsively chose Poster 5 and then changed his mind after reading the verbal information carefully. Likewise, most children from Year 6 said they did not understand Poster 5's picture. These results suggested that children might be initially

attracted to this sort of decorative picture but that to connect with and understand the poster they need to make sense of the picture. The children's lack of understanding of the picture in this poster was reflected in the large number of off-topic answers on the Be Safe list, mostly from the older children.

In contrast, Poster 2 (which also has a decorative picture) seemed to have attracted attention and communicated the message, and it was also chosen as the best poster by many children in both age groups. The emojis in Poster 2 were praised by most of the children, even if the poster was not chosen as the best poster by all of them. In this study, no child tried to make sense of the picture in this poster or to justify their preference by any reason other than their affection for emojis.

Study limitations

The limitations of this study were also encountered in the study done in the other school.

- Younger children were more dispersed: the children from Year 3 were again more mobile and dispersed than those from Year 6, possibly allowing those children to see other posters. Since in the three schools where studies happened the younger children always behaved in the same way in each of them, their behaviour should be considered standard behaviour when designing H&S information or conducting research with this age group.

- Study environment was not consistent: also similar to the other studies, the environments where the conversations with the researcher took place, with constant interruptions and, in this school even with children being withdrawn from the study half way through, could have influenced children's discussions as well as the consistency of the data.

7.7 Second study discussion

Although working in group sessions allows children to elaborate on the topic while discussing it and generates richer responses than when working with individuals, there is the potential hazard that some individuals might influence others, which will have an impact in the data. This could explain some of the differences across schools and across studies, particularly when conducting group sessions in the school environment, which accommodates many competing activities. Nonetheless, the type of material tested in this research is often delivered to children in such an environment, which should be considered when designing H&S information for this population.

Some of the outcomes of this study are highlighted next, and the results from the studies done in both schools are considered.

Informative pictures

Poster 1, with the complex informative picture, seemed to have communicated the message correctly to all of the children who received it in both schools. However, in school B, some features of the picture were somewhat distracting for the children, similarly to in the first study at school A, but this time it was more evident with the

younger children than with the older ones. In contrast, in school C, the pictorial information in this poster seemed to have reinforced the verbal information with no or little distraction.

The other poster with an informative picture, Poster 4, was designed to embrace the *coherence* multimedia learning principle, taking into account the distracting visual information problem that was noticed in the first study at school A (Chapter 6). Reducing extraneous elements seemed to have been effective, as Poster 4 prompted all of the children working with it to give accurate information and no distracting visual features were noticed. Nonetheless, the improvement in children's answers was less marked in school C; and the preference for this poster was high only in school B and among the older children. Few of the young children chose this poster as the best one. Therefore, the low preference level of all of the children for this poster should be taken into account and investigated. Perhaps the limited range of colours in this poster did not stimulate the children, which should be taken into account when designing H&S information for children, because when children indicated that they liked pictures, this seemed to influence the effectiveness of the pictorial information and their poster preference, as discussed next.

Decorative pictures

In contrast to the children in school A (Chapter 6), the children in this study tried attributing meaning to the decorative pictures, an effect more evident in the school B than in school C. However, what could not be identified is whether the children would have tried to attribute meaning spontaneously or whether it was a consequence of the discussion group. Nonetheless, making sense of decorative pictures has two implications for poster effectiveness. The first is that when trying to make sense of these pictures, children might overload their cognitive capacity (see Chapter 5). In this situation, it might be that the cognitive capacity that could be used to process the main message is instead used to try to understand the pictures, causing a cognitive overload, which could result in fragmented learning. This could have been the reason for the high number of off-topic answers from the older children working with Poster 5 who said they did not understand its picture. The second implication is related to children actually determining the meaning of the pictures. When this happened with Poster 5, some children chose it as the best one.

Nonetheless, there were some disparities between schools when the children were trying to make sense of the pictures. In school B, the older children thought the emojis in Poster 2 were connected to the poster's message, but the younger children did not see the connection, saying they preferred this poster because it 'tells what to do', which was a way of rationalising their preference. In school C, no child tried attributing meaning to the emojis, and the children used an emotional/affective explanation, saying they liked that poster because they like emojis.

Another interesting outcome was that although all posters include the same verbal information and therefore 'tell what to do' – as

the younger children in the school B said – the younger children also thought Posters 3 and 5 are not good as they do not show the risks of texting and walking. The two views for the same condition indicated that the choice of Poster 2 as the favourite poster in both schools was an affective response, although some children in the first group tried to justify choosing it by giving different types of reasons.

Additionally, when the children tried attributing meaning to the pictures and were not successful in doing so, the picture was therefore likely to be ineffective in helping the message communication. This was often the case with Poster 5. Thus, the responses to both decorative pictures in the two schools suggested that children's liking for pictures makes the lack of meaning somewhat irrelevant. More than that, in school C, the younger children's written answers suggested that the emojis attracted their attention, prompting them to read the poster's verbal information. This is compatible with the previous research discussed in Chapter 2 which suggests that pictures can affect emotions and attitudes, produce enjoyment and appreciation in children, and engage and disengage people in certain campaigns (Peeck 1987; Fang 1996; Houts et al. 2006; Joffe 2008).

A down side to the decorative pictures in this study was also shown. Regardless of the children's affective response to the pictures, when working with Poster 2 and 5, the children provided a number of unrelated answers that could be disruptive to the efficiency in communicating a message. Nonetheless, some unrelated recommendations were also made by the groups working with informative pictures.

No pictures

Poster 3 communicated the message to the groups from both years but was not chosen by any child as the best poster. On the contrary, all of the children agreed that this poster looks boring. Testing this poster demonstrated that although adding pictures to the posters presented some issues, they were still deemed by the children to be better than a poster with only verbal information. As suggested by Sung and Mayer (2012), as previously reported in Chapter 5, whether the pictures are decorative or informative, they seemed to bring benefits, either by attracting children into reading the posters or helping to communicate the message.Children's possible disconnection with the posters.

A comment is worthwhile in regard to the possible disconnection between the children and the posters' topic. In the two schools, but more evident in the first one, a few children from Year 3 mentioned 'texting and *driving*' and '*playing* and walking', which suggested some dissociation between the children and the topic presented in the posters. Each of these two modifications of the posters' verbal information suggested an argument that explained why these posters were still valid for children in the age group studied. The first recommendation associates texting with adults (i.e. drivers), demonstrating that the children were aware that adults should not text and drive. This suggests that such messages are getting to children at an early age, which is similar to the first study's suggestion (see Chapter 6) that existent policies are

getting certain messages to children at an early stage in life. The second recommendation adapts the action 'texting on a phone' to an action that seems to relate better to what children that age do: 'playing' on a phone. The children's ability to swap 'text' for 'play' suggests that they understand the message by translating it into an issue that is familiar to them.

This chapter demonstrated the results of the second study reinforce some of the results of the first study and somewhat contradict others. Thus, the commonalities of and contrasts between both studies are discussed in the next chapter.

Chapter 8 | Discussion of the two studies

This chapter brings together the two studies conducted with children in this research. Initially the differences between the procedure in the studies are discussed bearing in mind they might have influenced the results obtained in each study. Following, the outcomes of both studies are discussed in general and looking at the specific features tested in the posters. Finally, some conclusions are drawn in regard to the different poster conditions tested and the targeted audience.

8.1 Two studies, different variables

The results of the two studies, conducted in three schools, might have been influenced by the methodological variations of the studies and the different circumstances in which they were conducted. The outcomes of the first study were more clear-cut than those of the second. Some factors intrinsic to the studies and others external to them are likely to have contributed to the resulting data. The intrinsic factors are related to the different methods used and the different material tested in each study. Although the methods in the second study were refined to strengthen the findings, they might also have resulted in loss at some level. There are three intrinsic factors:

1. Discussion introducing the topic prior to the tests: in the first study, the teachers introduced the H&S topic to the children, which did not happen in the second study. In the first study, this introductory discussion might have focused the children's attention on the task, whereas in the second study the absence of a teacher introduction might have meant children were less focused on the topic at the beginning.

2. Baseline question: the baseline question used in the second study allowed verification of whether the children's understanding of a poster had improved after receiving the posters. Such verification influenced the understanding of the results of both studies. The children's written answers in the first study could not be assessed in comparison to their previous knowledge. If this had been done, it could have resulted in more subtle tendencies than they were actually found, or the results could have been clearer. If no baseline question had been asked in the second study, some posters might have appeared to be more efficient than they were found to be with inclusion of the baseline question.

3. Set of posters: testing only one set of materials (three posters) might have limited the findings of the first study, as pointed out earlier (see first study limitations on page 86). Testing two types of each picture in a set of five posters elicited subtle variations in the children's responses to the posters, as shown by the second study. However, due to the circumstances in which the studies were conducted, a wider range of posters also implied trends that were less explicit.

Besides these intrinsic factors, three uncontrolled factors that are likely to have caused different outcomes are as follows:

4. Environments where each study took place: the researcher's lack of control over the schools' environments created different atmospheres

for the studies, which may partially explain the different responses given within each study and across the studies. The recurrent problems were different classroom layouts, which might have allowed some children to see other groups' posters, and different areas where the discussion with the researcher happened, with the research often being disrupted by other ongoing activities.

5. Groups formation: the different ways of forming groups in the schools were also problematic. In the first study, the groups were formed with the aim of including a mix of abilities in each group, whereas in the second study, groups were formed according to children's seating position in the classroom, and therefore according to children's affinity with their fellow pupils. This could have influenced the studies in two instances: in the first situation, children more able in some aspects could have influenced the results of children less able in those aspects, which was noticed in the case of one particularly talkative child in one of the groups in the first study. In the second situation it is possible that children with the same level of abilities formed some groups, resulting in richer discussions in some groups than others. Whether this happened, however, cannot be confirmed.

6. Children's behaviour: as pointed out in both studies, the children aged 7 and 8 were more dispersed and less focused than the older children across the three schools. This suggests that there is a pattern in the behaviour of children of this age group, which should be considered when designing for them.

Bearing in mind these aspects, the dissonance and commonalities of the results of the two studies are discussed next.

8.2 Overall view of the two studies

The first study suggested that there were different responses to the three posters tested by the two age groups. In short, the informative picture seemed to have benefited more 10- and 11-year-olds than 7- and 8-year-olds, and the decorative picture had the opposite effect, benefiting the younger children more than the older ones. In the second study, such polarisation was less evident, and all posters seemed to have communicated the message satisfactorily to both age groups, although some subtle variations were found. The older children in the second study demonstrated the ability to infer, from the risks depicted in the informative pictures, the need to take care while using a phone. This sort of inference may also explain the better performance of Poster 1 for the older children in the first study: the developmental age of each age group was different. Older children have a greater working memory capacity and domain-specific knowledge than younger children; their ability to think about possibilities rather than focusing on what is presented in front of them could make them more capable of elaborating on the content of pictures and inferring more meanings than younger children.

Linked to the assumption noted above, the realism of the pictures was only discussed by the older children in both studies; they considered it unlikely that a banana skin would be on the floor or would be so yellow, and thought it improbable that someone would slip on it. Again,

10- and 11-year-olds were elaborating from the pictures, whereas the younger children in the second study focused on the reality presented to them, referring to the informative pictures only literally, for example recommending not walking into a pole (when working with Poster 4). On the other hand, somewhat contradicting this dichotomy, the older children in the first study and the younger children in the second identified a littering problem in Poster 1, which suggested the existence of distracting pictorial information.

In this sense, Poster 4 reinforces Mayer's's (2009) coherence principle of multimedia learning which suggests reducing extraneous details so that meaningful learning can happen. This poster, with reduced extraneous details, demonstrated efficiency in communicating the message. However, it was the most preferred only by the older children in one school and had a low preference rate among children in the other three classes. This low preference reinforces the idea of Schnotz, Fires, and Horz (2009) that reducing all extraneous details could result in material that is not interesting enough to attract the learner's interest. In a situation in which children were not prompted to work with the posters, for example if Poster 4 was hung on a wall, perhaps it would not attract enough attention to be noticed and to communicate the message. Although the objective of the study was not to assess the efficiency of the posters in such a setting, this circumstance of use should be considered as H&S information is often presented in this way (although it is also often presented to children through activities involving the material). Poster 4 had a smaller range of colours compared to the other posters, and perhaps expanding the range of colours in its picture would have prompted a more engaged response from the children than as it was actually presented.

Common to both studies was the fact that most of the children were enthusiastic about the emojis in Poster 2, and this enthusiasm was reflected in the number of answers related to the poster's topic. This suggested that this particular decorative picture attracted children and directed their attention to the message, working in the same way as the attentional pictures defined by Levie and Lentz (1982) (see Chapter 2). Pictures are believed to stimulate reading by directing children's attention in a text, as well as determining children's decision to read a book or not.

However, when looking at the children's preference for the posters tested, Poster 2 was the favourite of most of the younger children, and of the older children in one school. This preference seemed to relate to children's attribution of meaning to the decorative pictures in the second study. The older children only chose Poster 2 or 5 when they made sense of their pictures, justifying their preference by giving a reason. The younger children, however, chose those posters because they liked them, and even when they tried to rationally explain their choice, their reasoning was weak (e.g. saying 'Poster 2 tells you what to do'), suggesting that the choice was driven by emotions.

Perhaps how much the children liked or did not like the decorative pictures was a factor that influenced the picture's effectiveness when directing the children's attention to the relevant information. In contrast

to Poster 2, Poster 5, with a decorative picture that was liked less by the children than the emojis, was the less preferred among all posters with pictures, was not understood by many children, and prompted many off-topic answers, mostly among the older children. As discussed in Chapter 2, decorative pictures can be detrimental to learners – even though there is no agreement on whether they are more harmful to more capable learners or to less capable ones.

Poster 3 was classified as boring by the vast majority of children in the two studies (except three children, as reported in the first study), although it communicated the main message fairly well. It should be noted that the younger children in the first study were not interested in this poster and therefore responded with unrelated recommendations that were not based on the poster at all. In the second study, one of the groups also wrote unrelated answers, but not as many as those prompted by Poster 5. Poster 3, being the control poster with no pictures, reinforces Sung and Mayer's finding that any picture elicits better satisfaction ratings than no picture.

The posters designed for the studies included a combination of affirmative (i.e. look out) and negative (i.e. don't text and walk) verbal information, which was not the most common approach in the sample analysed. Still, there was no evidence in children's answers that the style of the verbal information was detrimental to the children's comprehension of the posters' topic. On the contrary, all posters, including Poster 3 with no picture, communicated the main topic to the children. This could be a joint result between the clarity of the verbal information and also its conspicuity. The vibrant colours, high contrast and bold typeface, might have helped to attract children's attention, and consequently communicate the message.

8.3 Concluding remarks of the two studies

By analysing the outcomes of both studies, three main tendencies can be highlighted that arise from their commonalities.

1. Informative pictures communicate slightly better for older than younger children: older children's ability to think about possibilities, which fits with their developmental stage, means that they benefit slightly more from informative pictures than younger children. This was suggested in this study by their better understanding of Poster 1 than the younger children; the take care advice inferred from this poster; and their attribution of meaning to decorative pictures to justify preferences or dislikes. Also related to their developmental stage was the older children's rationalisation of the scenes depicted: they problematised the banana skin on the ground and the fact that children are not allowed phones in school. These elaborations from pictorial information, combined with their preference for Posters 1 and 4, suggests that informative pictures with few extraneous details could be ideal for this age group.

2. An emotional response to pictures benefits younger children more than older children: the fact that younger children pay attention to what is interesting to them, their difficulty in thinking about

possibilities, and their focus directly on what is presented, fits with their developmental stage, and suggests that they would benefit more from decorative pictures than older children. Year 3 children were able to focus on the verbal information in the posters that displayed the picture they liked, although some unrelated advice was also triggered. A possible reason for the majority of Year 6 children benefiting less from Poster 2 than the younger children could be that many of them tried using reason to make sense of the decorative pictures and were not driven by their emotions, which is similar way to how they approached their discussion of the realism of Poster 1's picture.

3. Aesthetics should be considered: besides children's affection for emojis, which was translated into excitement when they saw Poster 2, the appearance of the poster also seemed to be important when designing for children. This was demonstrated by Poster 4's efficiency in communicating the message despite, but, nevertheless, low preference rating, mostly by younger children, who seemed to have preferred the most colourful posters.

This chapter discussed the results of the two studies conducted in this thesis, demonstrating that some of the different outcomes might have resulted from different variables in the methods and settings of each study. Some commonalities between the outcomes of both studies were noticed and indicate probable tendencies in children's response to the H&S information tested. Without over-extrapolating, the results suggest some tendencies that should be considered when designing for children.

Chapter 9 | General discussion

In this chapter I examine the outcomes of the two studies discussed in the previous chapter in relation to the existing research and the current status of H&S information provision for children. Initially, the chapter brings together theory and practice involved in designing for and conducting research with children. After that, I propose a new classification of pictures based on children's responses to different conditions in the posters tested, and the differences in the age groups are discussed. Some methodological issues concerning working with children are then raised and discussed, highlighting positive aspects of this research that might help other researchers and designers when they are working with children. Finally, I conclude by pointing out the answers reached and the limitations encountered throughout the thesis for the benefit of future research.

9.1 Theory and practice

The lack of research about H&S information for children regarding its visual aspect and impacts and the necessity of transposing theories from other areas to develop this research were stressed throughout this thesis. The importance of considering theory and practice was first demonstrated in this thesis when the framework for analysis was being developed; the framework emerged from those related theories and from the sample of existing material. Now, having conducted two studies to verify children's responses to different treatments of H&S information across two age groups, some insights into how specific research and theories in this area could be developed are presented.

The three main features tested in the five posters designed during this research were defined based on the analysis of the sample collected. The analysis was made to identify visual tendencies in H&S information for children, which seems not to have been documented in the literature yet. Relevant theories in similar areas suggested what would be the impact and effectiveness of the pictorial and verbal information used in the posters in the two studies. The results of the studies corroborated some of those suggestions, but also indicated some of them would need to be adapted to take into account aspects particular to type of materials and their topics, as those investigated in this research. The clearest outcome of the two studies was that the posters with any type of picture were more effective than the poster with no picture, which was not engaging for children. A similar finding was found among university students (Sung and Mayer 2012), and the importance of pictures in other artefacts such as books has also ben suggested by other research (e.g. Levie and Lentz 1982; Peeck 1987; Fang 1996; Zimmermann 2008; Norman 2010). Because of the results of this earlier research, the result in my study was expected. Nonetheless, it expands the previous findings to posters for children, which were not included in other authors' research. Additionally, it validates the ubiquitous use of pictures in the sample of H&S information analysed.

The problem of ambiguity

Within the sample of H&S information, depicting behaviour that put children at risk was not a common strategy; however, the studies conducted in this research demonstrated this to be a possible approach in specific situations and for specific topics. In the posters tested, showing the risks of behaving incorrectly might have helped children to understand the message. In other artefacts, however, this strategy might not be the best one; see the earlier example from the sample, in which the picture depicted children running in front of a vehicle (Figure 26b). The material advised not running in such circumstances, but the picture could be misunderstood as advising running in order not to be hit by the tractor. Thus, the potential hazards arising from showing the incorrect behaviour discussed in this thesis were that children might misunderstand it or imitate it, and information providers would be very cautious about the possibility of encouraging risky behaviour. This issue has also been reported when posters showed the consequences of dangerous actions, such as in a poster showing a train sign warning children not to stand up on seats; it was misunderstood, and viewers of the poster thought the child was unhappy because they wanted to balance on the seats but were unable to (Waterson et al. 2012).

On the other hand, depicting consequences was determined by the DfT (ChildWise 2011) to be a better approach than depicting the correct behaviour, which led to their Tales of the Road campaign; this depicts somewhat frightening situations involving children not following road safety rules. This campaign was evaluated as effective and well received by children in the age group studied in this research, and its pictures are not ambiguous, which facilitates their interpretation. Therefore, pictures should be carefully designed so that they do not include ambiguities that could generate misunderstandings. This could be done by using graphic elements to emphasise the relevant information, as suggested by Mayer and Estrella (2014) and as done in Poster 1 (girl's look represented by the dashed line, and the yellow banana skin) and Poster 4 (four lines next to the pole to bring attention to it).

Another possible way to decrease the ambiguity of pictures is to depict a comparison of behaviours. This strategy was not identified in any examples from the H&S sample but was used in Poster 1, which was understood by the vast majority of children in the three schools. However the communicative problems of this picture and the potentially distracting elements, identified during the discussions, about littering and about the lack of realism of the scene depicted in it corroborated the need to design pictures with focused content. To achieve that, some of the principles of the CTML (Mayer 2005) could be valuable by helping to identify and eliminate possible features that could distract children from the main topic. However, the present research also suggested that eliminating all details that are pleasant for children, even if they are unnecessary, could result in an uninteresting and less engaging picture; this has already been suggested by Schnotz Fries and Horz (2009), and leads to the next point.

The emotional response to pictures

The results of the two studies conducted in this research may partially explain the high number of decorative pictures that were found in the sample of H&S information. Three points were noticed in this respect. First, the two posters with decorative pictures in the two studies communicated the main message satisfactorily to most of the children, as did the other three posters. Second, Poster 4 (Study 2), which had an effective informative picture and prompted punctual answers regarding the poster's topic, was not significantly preferred by the children, which could have been a result of its limited range of colours, implying that it is a less interesting picture. Third, the children were enthusiastic about the emojis and less impressed by the decorative picture in Poster 5; this is likely to have been due to emojis' popularity among the children.

IIt seems that decorative pictures can be effective in H&S information for children, evidently not in an informative way but by attracting attention to the artefact, engaging the viewer, and supporting the verbal information within it. As for attracting attention, the children's enthusiasm for the emojis demonstrated emphatically how this happens and also showed children's affective response to them. In other words, this picture roused the children's interest, which could be a determinant for engaging them with the material. One issue with decorative pictures that researchers found in learning materials was that they seem to create situational interest but do not maintain it to engage learners with the material (Magner et al. 2014). This, however, might be the strength of decorative pictures in artefacts such as posters, which are made for brief communications and hence do not require continuous engagement with several topics. The emojis also supported the verbal information, possibly acting as contextual cues to the topic in particular instances. This was noticed in the younger children's answers in the first study, and in the older children's explanations of the connection they perceived between the emojis and the poster's theme in the second study.

Similar to Poster 2, some of the decorative pictures in the analysed sample of H&S information had a connection with the artefact's message – for example, depicting a fireman when instructing on fire safety. Others did not have an obvious link with the topic but seemed to have the potential to elicit an emotional response from children given their great range of colours, the picture style, and the entertaining scenes depicted. Although most of the decorative pictures in the sample seemed to have the necessary characteristics to engage children, others did not seem to be attractive to children (although this is from the researcher point of view – children might think differently) and could result in a similar response to the picture in Poster 5 in the study. This picture did not elicit the same affective response that the emojis did, and was often not understood by the children. Children's response to the pictures in the sample can only be verified by testing each of them, meaning their effectiveness cannot be determined here.

Having said that, it is worthwhile reminding ourselves that it was not only positive emotions that were discussed in this research as possibly effective for communication purposes. It has been suggested

that both positive and negative emotions are deactivating or activating, affecting students' performance when they are learning (Pekrun et al. 2002); some authors believe that fear and disgust, for example, might be persuasive (Joffe 2008). In this respect, see, for instance, the Tales of the Road campaign that uses somewhat frightening pictures and which, as noted above, was found to be effective and well received by the wide age group studied in this research. Unfortunately, the evaluation report about this campaign did not assess what sort of feelings were elicited from children, so the role of emotions in making this campaign effective is so far unknown. In the rest of the sample of H&S information collected for this research, on the other hand, most of the pictures (both decorative and informative) seemed to have been designed to arouse children's positive emotions, as the pictures tended to be colourful and fun, even when treating delicate themes.

Clear, attractive pictures

Although it seems almost unnecessary to say, pictures that have a significant impact on children's emotions and/or clear, informative pictures seem to be more appropriate choices than less attractive and complex informative pictures for H&S posters for children. The research in this thesis shows in addition the need for clarity, reduction of extraneous details, and an emphasis on relevant information, aligning with theory from multimedia learning research (e.g. Mayer 2005; Mayer 2014; Mayer and Estrella 2014) that often investigates other sorts of materials with an older audience. Given the characteristics of the material studied in this thesis, which are somewhat different from those on which the multimedia learning theories are founded (see section 2.2.3), other aspects should also be taken into account, such as younger children's affective response to pictures.

9.2 A new classification of pictures

The present thesis discussed in Chapter 3 the many ways in which pictures were classified by different researchers. Each classification considered different aspects, uses, materials, and purposes of pictures. For example, pictures are usually classified in regard to their function in books, where they are said to be part of the story, to teach concepts, to delight the reader, to support the text, and so on. These theories do not necessarily consider the viewers' interpretation of pictures and may only consider the designer's point of view, i.e. the intended meaning of pictures and accompanying texts. In this respect, perhaps the most comprehensive approach discussed was not a classification per se, but a model to analyse the comprehension of pictures; this model was developed by Goldsmith (1987; 1984) (see Chapter 3). Her model considered the different levels at which pictures work, taking into account both the designer and the viewer in the process of 'reading' pictures. But because this model was developed to analyse pictures, it would be difficult to use as a resource for designing new materials, as in such a situation the model's strength, that it is wide range of application, might also be its weakness. It is not the easiest or fastest tool that could be used by designers on a daily basis.

Thus, based on children's responses to the posters tested in this research, in which pictures' functions of attracting attention and of supporting the understanding of the message was evident, a new classification of pictures is proposed to advise designers how to use them in H&S information for children. Prior to presenting the new classification, it is important to recapitulate how this evolved throughout this thesis. For the framework of analysis three types of relationships between pictorial and verbal information were identified: addition, reinforcement, and decoration. The analysis of the corpus in Chapter 4 resulted in a simplification of this classification into informative pictures and decorative pictures, which was pertinent for that stage of the investigation of this thesis. Later on, I also discussed the cognitive theories (Chapter 5) in which decorative pictures were often categorised into seductive details or decorative pictures (Sung and Mayer 2012) depending on their effects upon the viewers. Finally, after testing the posters with the children in the two studies conducted and analysing their responses to each picture, it became evident that a different categorisation of pictures was pertinent for the sort of materials designed for children in which the pictorial information has more importance than or at least equal importance to the verbal information, as in the H&S posters studied here. Note that I am referring to a classification of pictures rather than to the relationship between pictorial and verbal information because this research mainly considered the effect of the pictures, as the verbal information remained constant in all posters tested.

Thus, I propose the classification represented in the diagram below (Figure 60). Starting from the wide classification suggested after the analysis of the materials, and considering two types of pictures, informative and decorative, each classification is subdivided into two other categories. The informative pictures can add to or reinforce the information in the accompanying written text, and they were used like this in the framework of the analysis; the first category can add related or extraneous – and therefore possibly distracting – information. The decorative pictures can be abstract or concrete; the latter description is split into supportive and neutral types. There is a continuum at the lowest level of the diagram, as each picture might contain more than one type of information (i.e. related/extraneous and supportive/neutral information). The shaded boxes in the diagram indicate pictures that, on the basis of the research carried out in this thesis, are likely to have an impact on the effectiveness of the poster's communication. The boxes that have darker shading are likely to have a positive effect by reinforcing comprehension of the message, whereas those with lighter shading are likely to have a negative effect by distracting from comprehension of the message. Boxes are left unshaded where the research in the thesis does not support predictions about their effect. The classification is explained in detail next.

In this classification, the *informative pictures* are those, as previously defined in this thesis, that add to or reinforce the information in the accompanying written text. In adding information, the so-called *additive informative pictures* can bring *related* or *extraneous* information to the

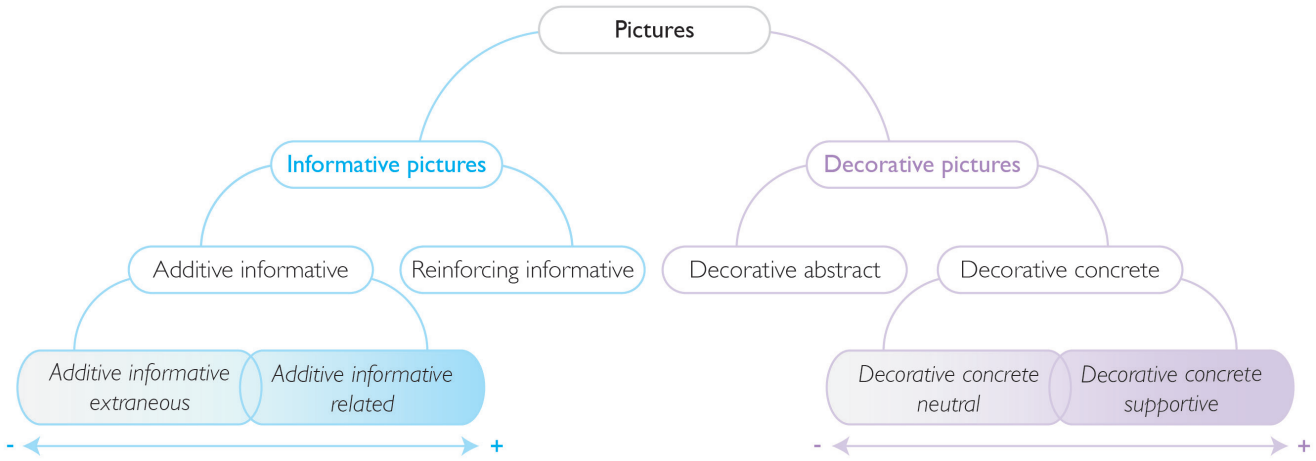

Figure 60: Pictures' classification based on children's responses to the posters tested.

material. In the first case, the message of the material is strengthened, and with the second possibility the extra information might be distracting for the viewer and divert him or her away from the main message. Note that one picture can fit into both classifications, as it can present both related and extraneous features. Pictures that carry extraneous information might be useful in materials such as storybooks, as they might expand the story being told, but in H&S posters they might be harmful to the effective communication of the intended topic. Perhaps because of this potential issue, this type of picture appeared in only 11 of the 64 examples analysed at the beginning of this research. Additive informative pictures are exemplified in this research by the drawings in Posters 1 and 4. They both added risks of texting and walking to the message, which were related to the topic. The first poster also included a comparison between the safe and the dangerous behaviours. In doing so, however, it also added extra information that distracted some children from the main topic, prompting them to discuss other irrelevant matters. Hence, the picture in this poster is classified as additive informative, being both related and extraneous, whereas that in Poster 4 is additive informative related.

The *reinforcing informative pictures* are those that pictorially represent the verbal information, helping to restrict the topic. They are similar in intentions to those ideally used in textbooks, as they intend to communicate the message with no or little ambiguity, emphasising the most important information contained in the artefact. In posters, they literally represent the verbal information, such as a road safety poster that advises children to wear a helmet and depicts a child wearing a helmet. Perhaps because they restrict and emphasise relevant information, these were the most used pictures in the sample analysed. Reinforcing pictures, however, are not flawless. In repeating the verbal information, ambiguities might be created, which might be the case when depicting the incorrect behaviour with an 'x' symbol over it, indicating it is wrong. Children might not fully understand this visual code, or might not pay attention to it, and therefore interpret the incorrect action as the correct one.

Decorative pictures, as they are usually described by other authors, are those mainly used to attract viewers' attention. This can be done through a particular visual style, such as that used in NSPCC posters that aim to prevent the abuse of children (Figure 23), but also through what the

picture represents to the viewer, which was the case regarding the emojis used in Poster 2 in this thesis. The decorative pictures are not intended to be 'read', or at least that is not the designer's intention; however, they might be read by the viewer, which in this research happened when children tried attributing meaning to the group of children depicted in Poster 5, for example. Decorative pictures in this proposed classification either depict recognisable referents or are abstract. The first type, the *decorative concrete pictures*, represent recognisable referents (real or not). If they are related to the artefact's theme or if they are highly attractive to children, they are classified as *decorative concrete supportive*. An example of this sort of picture is the emojis in Poster 2 tested in this research, they are concrete and relate to the poster's topic, as they are features used in textual communications on mobile phones; additionally, they were highly attractive to children. The same was noticed in the posters from the sample of H&S information that used using famous characters (e.g. Sesame Street character in a road safety campaign); this was discussed earlier in the thesis and was found to be a strategy that aims to induce a positive response from children to products (see Chapter 3). Unlike the emojis, such characters do not relate to the campaign topic, but the intention is to attract children's attention to the poster and therefore they have the potential to support the message. If the pictures are not, however, related to the main topic and elicit little attraction from children, they are called *decorative concrete neutral*. In Poster 5, the only element connected to the texting and walking theme was the drawing of a phone; the rest of the picture, the group of children, had no relation to the theme but did seem to have truly attracted children, exemplifying this category.

The last category of pictures proposed is *decorative abstract pictures*. Although pictures in this category carry some sort of information through their shapes, styles, colours, and so on, at most these pictures create an atmosphere in the artefact. Decorative abstract pictures were not found in the sample analysed as the main visual information, which demonstrates the assumed importance of concrete pictures for children, be they informative or decorative.

This classification is based on the type of response that the children in the two studies had to the pictures. Evidently, making sense of pictures is particular to the viewer and, as discussed earlier in the thesis, two people can be presented with the same material and have two different learning outcomes from it (Mayer 2009). So to confidently determine pictures' effects they should be tested with the targeted audience. In a first stage, however, this classification could help designers to choose the most appropriate pictures to achieve the artefact's objective.

9.3 Age groups' different responses to pictures

This research identified that a broad age group (6 to 12 years of age) is usually targeted with the same H&S information, despite differences in children's developmental stages within this age range. The consolidated theories in this area explain the cognitive differences between the two extremes of this age group. In this respect, although the first study

suggested bolder trends in each small age group (7- to 8-year-olds and 10- to 11-year-olds rather than a broad 7–11 group) and the second study had less marked results, it was clear in both studies that children in the two age groups dealt with the different materials' conditions according to the developmental stage that they were in at that time. Whereas the younger children tended to focus on what appealed to them, sometimes relying more on their emotional response to the pictures than on reason regarding choosing which material they would focus on, the older children were more rational than emotional when working with the posters presented to them.

In Chapter 2, when discussing pictures' abilities to attract attention and to produce affective responses, other authors were referred to as saying that pictures might produce enjoyment and delight children and even be decisive regarding their decision to read a book or not to read it. The effects described by these authors seem to be purely emotional responses to pictures, similar to the younger children's responses in the studies conducted during this research. Even when these younger children tried to present a rational explanation for why they preferred emojis, they somewhat failed, which suggests that they were indeed driven by emotions and, therefore, by what is interesting to them. This suggests that a high level of emotional connection might be more important for younger children than the pictures' accurate informative depiction. On the other hand, the older children's ability to reason found in the results of the studies suggests that they can benefit from complex informative pictures, although they could overthink these and focus on less important aspects of the pictures.

Some researchers suggest that learners might see pictures as less important than texts (e.g. Weidenmann 1989; Peeck 1993). This, however, has been found in studies with adults and/or children older than those in the age groups approached here. Given that children start their literacy with the support of pictures, and that children's visual perception varies according to their age and developmental stages (Yu 2012), it might be that they slowly grow up to identify that materials that mostly rely on pictures are child-like, easy, or not important. The children in the age ranges studied in this thesis, especially the younger ones, seemed to still see pictures as a valid and important way of communicating. Perhaps this transformation in the way of thinking along the childhood years could be seen in the older children's use of reason to discuss the pictures by attributing meaning to them and discussing their realism.

These differences are important to consider because in this research H&S information was identified as being delivered to children under different circumstances. In situations such as those tested here, where the posters were presented during school lessons, the communication of the message could be somewhat controlled by the teachers so that it happened efficiently. But such materials could also be hung on walls without accompanying activities involving them, in which environment there is little or no control of how the message is communicated. The differences in children's cognitive development might then be determinants for how such artefacts are seen and understood. Additionally, there is a difference between what children

might say in interviews and what they might do out of the interview context, which is a problem in much interview data. For example, Zeedyk and colleagues (2001) determined that knowledge about road safety does not improve children's behaviour on roads. Thus, further investigation is needed in this area in order to understand how to improve the impact of H&S campaigns.

9.4 Designing for and research with children – methodological approaches

Besides there being scarce research about H&S information for children to refer to, other methodological difficulties were encountered during this thesis specific to practical research with children. These difficulties were related to (i) the environment in which the studies took place, (ii) the children's behaviour, and (iii) the specific methods used. There were advantages and disadvantages in respect of (i) the environment in which the studies happened, i.e. at school. The benefits relate to the participants' familiarity with the environment in which they are used to participating in activities involving other H&S informational materials. This familiarity may have resulted in more genuine responses than if the posters were tested in a controlled laboratory, where children would be removed from their comfort zone. On the other hand, the problems of realising the studies in schools were related to a lack of control of that environment, which resulted in different settings across school years and across schools, and ongoing school activities during the studies that were often disruptive. In either condition (i.e. more or less controlled), although the children were reassured that they were not being tested, there is always the risk that children change their behaviour when they think they are being assessed (Zeedyk et al. 2001). Nonetheless, there are precedents for this 'real context' approach to conducting research with children and designed materials (see, for example, Zeedyk et al. 2001; Walker and Reynolds 2003), although there are some differences in the methods used (particularly the group discussions used in this research) that perhaps imply that different difficulties may be encountered.

Another issue faced during the studies was (ii) the children's behaviour. If the environment was difficult to control, the children's behaviour was nearly impossible to control. It became evident in the three studies that the younger children were more dispersed and less focused than the older children. Although their behaviour could have influenced the results, as some children may have seen other posters besides the one they should have been working with at the beginning of the studies, this might be their typical of their classroom experience, as discussed in the previous chapter. Thus, not only when designing for children, but when conducting research with young children, this should be taken into account, as the real context of use might influence the development of the study as well as its results.

Regarding (iii) the specific methods used, getting feedback from the children proved to be a challenge. If, on the one hand, group activities are likely to initiate more discussions and therefore rich and elaborated responses from children, on the other hand, dominant children might influence others. This was evident in the first study,

but it could have happened in more subtle ways that were not easily perceptible in other groups. To mitigate group effects in this research, both written (in pairs in the first study and individually in the second) and group discussions were used. The alternative approach of interviews with individuals could have led to less elaborated answers and could have increased the children's perception that they were being assessed, which could have influenced their responses. Although the discussions with the researcher in the studies in this thesis were not considered to be those of a focus group per se, they resembled it, as they provided an opportunity for the children to discuss and react to each other's points of view, generating a diversity of ideas and feedback. This is a method that is often used when designing for children and evaluating existing material (see, for example, Waterson and Monk 2013; Boto, Noriega, and Duarte 2015).

As found in this research, other authors also report problems in using such methods. Morgan and colleagues (2002) documented issues they encountered when using focus groups made up of children from within the same age range as those approached in this research (7- to 11-year-olds). These authors enumerate three major issues: '(a) recruitment and composition of groups, (b) ways of promoting participation (…), and (c) issues and strategies relating to the group dynamics' (Morgan et al. 2002, 7). Recruiting participants is an ongoing issue known about by many researchers, and some of them are developing alternatives to overcome this difficulty (Martin-Kerry et al. 2017). In the work of Morgan et al., problems with recruiting children depended on parents' and children's availability, and this was an increasingly problematic element of this research. In my studies, finding volunteer schools and children to participate in the study was difficult, making the realisation of pilot tests unviable; additionally, children or parents forgetting to return the consent forms was an issue.

Morgan and colleagues (2002) also encountered difficulty with the varying size of groups caused by last-minute dropouts. The variable size of groups in the present research was an issue in the second study due to the way the children's groups were formed and to some children leaving halfway through the activity. Morgan et al. point out that having groups with more than four or five children in the younger age group (7- to 8-year-olds) makes it difficult to prompt all children to participate in the discussion and, as also noticed in this research, makes the session too noisy and difficult to transcribe. With smaller groups of two or three children, these researchers feel that the sessions become interviews rather than focus groups, and that children participated more than in larger groups. In the research in this thesis, however, children in smaller groups tended to speak less, therefore generating less data. The group dynamics, noted above, were also discussed by Morgan and colleagues, who reported differences in children's answers if they knew other participants in the group and if they did not know anyone.

The similarities in the problems identified by me and other researchers show that some of the issues might be predicted to be avoided. However, the different reasons for the same problems happening in different types of research also show that working

with children requires dealing with unpredictable issues that might affect the results of the studies. Despite the problems found, it is worth highlighting some positive aspects of the methods used in this research in order to help future researchers and designers when they are conducting similar studies.

1. Using more than one method so that one method can supplement another might be helpful. This is suggested by Morgan et al. (2002) and was found to be true in this research. The children's answers on the Be Safe lists proved to be helpful and complementary to the discussions with the researcher. The combination of both sources of data allowed some answers to be verified, making the data stronger than if only one method had been used.

2. Comparing two groups allows the identification of particularities that would be lost if only one group with a wider age range was studied. As a result of conducting this comparison, some tendencies could be found in this research, suggesting that smaller groups of each targeted age range should be considered when evaluating or designing artefacts.

3. Prompting children to work with the tested materials makes them engage with them. Carney and Levin (2002) say that asking children to work with pictures enhances the chances of their effectiveness in communicating messages. This should be considered both as a way of making H&S information effective and as a possible factor that influenced the studies' results. Perhaps if the posters were presented without an activity involving the children, the responses to each poster condition would have been different.

9.5 Conclusions

This thesis has investigated H&S information for children, specifically posters and similar materials, focusing on their picture characteristics and targeted age group. The sample of existing materials collected in the early stages of the research was vital for developing detailed research questions and provided the features that were tested in the posters. The framework developed here was a valuable tool and can be used in other situations; although it might require adaptation to analyse other artefacts since the framework emerged from the sample itself. Depending on the sample to be analysed and the objectives of the analysis, different categories could emerge from the process of adapting the framework. For example, the categories of the framework proposed here were created with emphasis on analysing the pictorial information of the sample. As this framework is flexible, another researcher might look at other characteristics of the sample, resulting in a different framework, and therefore they might identify different trends in the sample. For example, there could be a focus on the verbal information, or the specific use of colours, or even delimiting the sample of H&S to a single topic, as further discussed at the end of these conclusions. Nonetheless, results of the analysis conducted with this framework provided an initial documentation of existing H&S information for children, which does not appear to have been carried out previously. Despite some tendencies identified in the sample (summarised in page 54), H&S information for

children showed a range of variables that do not seem to follow the same pattern. Even within the so called typical characteristics, there were unanticipated variations that were consequently selected to be tested in this research, such as the functions of pictures to decorate the artefact or to inform the reader.

The two studies conducted in this thesis suggest that the use of the type of decorative and informative pictures found in the sample is, overall, appropriate for children. However some examples in the sample seem to be in more harmony with the findings in this thesis that some kinds of pictures are more appropriate for children in the age range studied than others. Additionally, this research demonstrated that other strategies, not often explored in H&S information for children, could be successful, such as depicting consequences, incorrect behaviours, and comparison of correct and incorrect behaviours. Nonetheless, these approaches should be used with caution depending on the topic, and more research is needed in this area, for example to consider the limits on showing an incorrect behaviour.

Observing the difficulties encountered in conducting the two studies here, and similar problems reported by other researchers, it is important to consider the research methods that design and other agencies use when developing materials for children. As pointed out in this thesis introduction, H&S information might be commissioned from designers but might also be produced by schools and organisations themselves. In both situations the materials may not necessarily pass through children's evaluation before being put in use. This thesis suggested that getting children's feedback about H&S information helps to improve the artefacts so they are appropriate to the age range targeted. If evaluation tests are not possible, however, other research with children, such as the present thesis, might contribute to the design process. When conducting research with children some issues such inconsistencies, group effects, and how children are selected for developing campaigns, might influence the outcomes of the tests and, therefore, the artefacts' design.

In this respect, a finding from this thesis that could influence agencies' approach is the identification of the wide age group frequently targeted by the H&S information examined in this research. This grouping considers children at different stages of cognitive development, as if they were considered in the same cognitive level. This thesis suggested that responses to the same material might be different between the two extremes of this wide age group. Evidently, producing different campaigns specific to a lower and higher age segments [14] might be restricted by funding in many organisations; nonetheless research conducted with separate groups might also indicate visual approaches appropriate to most children in the wider group.

Another significant aspect of this research is that the classification of pictures for books – an area where there is a body of existing research – might be different than for other documents, such as posters. The pictures' function of attracting attention, supporting the text, and being understood may vary according to the objective of the artefact.

14 This research focus on two age groups of 7-8 and 10-11 years-old, and it is unlikely to be a specific cut off between the two.

Designers should consider how much engagement is required from children to understand/ learn the provided information, how long would they spend with the material, and how the material is delivered to them, as this all might influence the effectiveness of the information. Children's response to the pictures tested here suggested a strong influence of children's liking for the pictures. This is important for the message communication considering children are heavily influenced by the pictures and, perhaps unlike adults, are not reliably able to reflect further on the meaning of the poster as a whole. Nonetheless, as mentioned earlier in the general discussions (see subheading 9.3), there are differences between people's stated response to stimuli and their actual response, due to limits on self-reflection. Children's declared preference for the posters might have suffered such distortion. Perhaps if the children had seen the posters in a different situation, the responses would have been different. This brings me to discuss some limitations of the present research.

There were some difficulties encountered in doing this research in regard to the participants and methods used (stressed in Chapters 6 and 7, and section 9.4, such as difficulty controlling the environment, different numbers of children in the groups, and individual children's behaviour) which seem to be inherent to research with children, as already discussed here. Other aspects may also have limited the results. One point to notice is that posters might stay on the walls in schools for a long time, and H&S information is often delivered via other media as well, such as television adverts and websites. Children's interpretation of such information may develop over time, whereas this research could only elicit immediate responses to the posters. Through the immediate responses I was able to ascertain that children, generally speaking, understood the information within the posters. However, conducting a post test a few weeks later could have yielded different findings. Additionally, the studies reported here used short-term retention tests, demonstrating children's ability to interpret and remember the information in the posters. Multimedia learning theories advise that in order to verify full understanding of the information transfer tests should be applied, asking children to use the knowledge acquired in different situations. Such an approach could be an interesting way of testing children's understanding of H&S or other materials beyond gathering opinions in group's discussions.

It is worth remembering that the multimedia learning research accessed in this thesis was based on materials in which continuous engagement with the information is required, which may differ from posters. Additionally, the use of multimedia has typically been investigated with students of an older age group than those tested here. The present research could not find studies that consider these theories across the different ages and cognitive development stages. Therefore, as well as investigating the impact of pictures on children of different age groups in the case of posters, which are designed to communicate information briefly, it might also be useful to investigate the application of multimedia learning theories, such as the CTML (Mayer 2005; Mayer 2009) and CATLM (Moreno and Mayer 2007), across the different ages

and cognitive development stages. Although there is an accepted view that pictures should support text content, it might be that for younger children, there is also a positive effect of decorative pictures, if their appeal draws children's attention to a text artefact.

9.5.1 Future research

As mentioned at the beginning of the conclusions, this research only investigated a small fraction of the typical features identified in H&S posters for children, and others could be investigated.

There are questions emerging specifically from the studies I have carried out that could be explored in future research to clarify some of the findings presented here. With regards to the methods used, three main questions were raised:

1. Would a post test, carried out a few weeks after the testing described here, have yielded different results? Would there have been different effects on children's understanding of the posters' message according to the variant of poster used; and would these effects have differed across age groups? Children's recall of the information, as tested in the present research, is important, but the potential of the information to transfer into everyday life is essential for efficient message communication. A post test might give some insights into this, by investigating children's information retention and knowledge transfer.

2. Would conducting individual conversations with the children instead of group discussions result in different responses from them? As mentioned earlier in Chapters 6 and 8, group discussions might have resulted in some children being influenced by others when giving their answers. In many circumstances children are likely to encounter H&S messages as individuals, without the opportunity to develop their understanding through discussion with others.

3. When hanging the posters on walls, which type of poster is more efficient in attracting attention and communicating the message? Although H&S materials are commonly introduced to children as part of school lessons, they may also be encountered individually, and in such circumstances there is a requirement to attract attention in a way that differentiates them from the classroom scenario.

The other questions that emerged related to the posters tested. They are:

1. Would decorative pictures with emotional impact on children similar to the emojis (e.g. famous cartoon characters) be as engaging to younger children as the emojis were in this research? This could relate to the common practice of using both cartoon and real life heroes to communicate to children (and adults) (see for example Mizerski 1995; Neeley & Schumann 2004; Molesworth et al. 2015).

2. Are age targeted decorative pictures, i.e. images that are currently trending among each age group, more engaging than the informative picture to each group?

Considering other aspects, future research could look into the verbal information, with regards to its meaning and visual aspects

(e.g. the different impacts of active and neutral presentation of verbal information), or considering its readability as well as its impact on information communication. The number and configuration of images in H&S information (i.e. discrete elements or synoptic images) was also not constant, and future research could investigate the effect of different approaches in communicating the message. Although there is existing discussion about the use of discrete and synoptic approaches (Twyman 1985, p.270), the efficiency of such pictures for children does not seem to have been investigated yet. As discussed regarding the picture in Poster 1 in this research, a synoptic image might comprise more than one message, intended or not, and might require more cognitive effort to be read and understood than several discrete elements. It might be that several discrete elements in a poster require a high level of cognitive processing, and perhaps that compartmentalising the information into discrete elements might make the message more difficult to understand.

3. Can the results of this research be replicated with different set of materials, for example, posters about other subjects and/or that contained only positive messages (i.e. not using 'don'ts')?

Replicating the studies of this research in other areas could be a step in a programme to generalise from the findings presented here, in order to provide resources for people commissioning design and designers so that they can strengthen the impact of H&S communication with children.

Appendix 1

Children's raw answers to the Be Safe list in the first study (school A)

Year 3 – Poster 1		
	Dos	**Don'ts**
1	Cross when the light is green Tell people to stop playing…? Drive only age 18 Jump of a plane with a parachute	Don't play on your phone when you are walking Don't skip in a wet area Don't break the law
2	Look when you walk Watch out where you're stepping Only talk to your family and friends Play safe games Cross the road safely	Do not text when you walk Don't look at the ground Don't talk to strangers Don't break the law Don't go out on your own if you're young
3	Don't wonder off Don't talk to stranger Don't go on bad website	I don't go on the website Don't break the law Don't talk in to strangers
4	Watch out for cars Always hold your mum's or dad's hand when crossing Cross when the lights are green	Don't drink drive Don't text when walking Don't run when crossing Don't walk on the road Don't cross when the red man is on

Year 3 – Poster 2		
	Dos	**Don'ts**
1	Cross when it is green only Look on both sides Never be outside when there is a thunderstorm	Don't play Pokémon Go Don't run because you could fall over Don't drink and drive
2	Look where you are going Look what's in front of you	Don't wake and go on your phone Don't talk to strangers Hold your parents hand Don't get drunk while driving Don't play on your phone when you're playing
3	Walk with someone you know Pay attention	(Don't) text on your iPhone (Don't) talk to strangers (Don't) walk without an adult
4	Look where you are going Cross road safely Hold your mum's hand	Don't play knock knock ginger Don't be on your phone while you're crossing the road

Year 3 – Poster 3		
	Dos	**Don'ts**
1	Hold a parent hand We need to be kind Be honest	Not to run on the road Not speak with strange people Not get out of the house without permission
2	Look when crossing the road Hold a adults hand when crossing the road	Don't cross the road without looking Don't talk to strangers Don't open the door without adults' permission Don't go on dangerous websites
3	Walking on the road with an adult Play fun games	(Don't) run on the road (Don't) play dangerous games (Don't) eat dangerous food (Don't) talk to strangers
4	Listen to your parents Look where you're going Hold your mum's or dad's hand when crossing the road	Don't play games when crossing the road Don't pay games that you're too young for Don't rush when you do stuff Don't talk to strangers Don't ignore your parents Don't eat food you don't know

Year 6 – Poster 1		
	Dos	**Don'ts**
1	Look when you're walking Have your eyes looking at all times Look for dangerous things Be aware of others around To be aware of cars while crossing	Don't text and walk Don't text and cross the road Don't litter Don't cross the road if it's not the green man Don't drink and drive
2	Warn the person by telling them there is something in the way Look when walking Be aware of your surroundings	Don't text while walking Do not litter Never play with an oven
3	Be aware when walking Stay safe near roads Pay attention to traffic lights Keep our sugar levels low	Don't text and walk Don't drink and drive Don't drink while pregnant Don't go down on dark alley ways

Year 6 – Poster 2		
	Dos	**Don'ts**
1	Look before you cross Say thank you Cross when it's the green man Keep your seat belt on Look at the road Don't get out of your car whilst he or she is driving	Don't walk on the road without looking Don't walk on the road when the light is red Don't answer a phone call when you're driving unless you're hands free Don't drive without a seat belt Don't drink and drive
2	Make sure no cars are speeding Keep your seat belt on Always watch the lights Stay in the right lane Look before you cross	Don't text whilst driving, walking Don't cross when the man is red Don't play ball games near cars Don't drink and drive Don't run into the road
3	Before you cross the road look left and right If you see someone hurt call 999 Don't eat out of date food Don't drink and drive	(Don't) talk to strangers Look out for green man (Don't) play ball games (Don't) drug drive

Year 6 – Poster 3		
	Dos	**Don'ts**
1	Look left and right before you cross the road	Don't be on your phone or you might get hurt Don't go on your phone in the car Don't drink and drive Don't smoke with children in the car
2	Look out for cars Check all your alarms in your house to make sure they work Drink lots of water Listen Obey the traffic lights Make sure that when you cross the road you look both ways When you have a break down make sure you stay out of the car	Don't text and walk at the same time while you are crossing the road Don't drink and drive Don't forget to put your seat belt securely Don't get distracted when you are listening to instructions that are about safety
3	Look where you are going When you are crossing a road look both ways Always listen to your instructor when you are climbing a cliff	(Don't) text while you're driving (Don't) drink whilst driving (Don't) smoke whilst driving (Don't) burn plastic (Don't) drive through a no entry zone (Don't) go where you're told not to (Don't) walk across the motorway

Appendix 2

Children's raw answers to the two written tasks (baseline question and Be Safe list) in the second study

School B' answers

Year 3 – Poster 1	
1st question	
You might drop the phone Bump into lampposts Or if you come to a corner without you notices you could fall onto the road	
So you don't walk onto You could hurt someone Crossing roads	
Be safe list	
Look when you are crossing roads Don't go walking about with a phone in your hand inside Look out when you walk	Don't walk around with phones in your hands Look out when you walk
If someone is texting and something is on the floor warn them not to slip and fall Be careful when walking with a phone	Don't text and walk

Year 3 – Poster 2	
1st question	
You need to watch the cars on the road Tripping over on the path and hurting yourself	
You need to put it in a bag	
Be safe list	
Turn your phone of when you are driving or walking across roads Keep your phone in a safe place so you won't be tempted to play on it	Don't play on your phone whilst walking around on roads Don't text, phone etc. when you are driving
Turn your phone of when you are driving	Don't text when you walk

Year 3 – Poster 3	
1st question	
To look where you are going as well Be careful not to drop it	
You have to make sure that you not on it for too long	
When you are crossing the road with your headphones on take them of	
Be safe list	
Have a phone instead If you're texting do it while sitting down	You shouldn't walk and text You shouldn't do it because you could get injured
Look out when you walk Look and listen when you're crossing the road	Play on your phone when you are crossing the road
Look where you're going	Text and walk

Year 3 – Poster 4	
1st question	
When you're crossing a road you might not look properly and get injured	
Keep it safe Don't drop it Don't get it dirty	
When walking around with a phone you need to be careful of crossing roads	
You can drop it Someone could steal it You could be concentrating on the phone and trip	
Be safe list	
Look and stop when you come to a road Stop when you're on your phone Look out so you don't bump into things	Don't cross a road with a phone Be on your phone when its busy Not check when you cross a road
Look where you're going Do walk but don't text	Don't walk into anything Don't trip over a pole
Look out for lamps, rocks and other things	Don't text and walk
Sit down on a bench when texting Stop when texting on a phone	Don't run when texting

Year 3 – Poster 5	
1st question	
You need to be careful if anybody steals it You need to be careful if you drop it	
Crossing the road Bumping into people	
Might drop it Someone might take it	
You need to be careful about crossing roads with phones You need to make sure you don't bump into anything	
You might drop it You might put it in your pocket and it could slip out	
You might drop your phone You have to be careful on a road	
Be safe list	
Look out when you walk with a phone	Don't text and walk because you might bump into something
You should walk without texting all the time You should stop then text instead of texting and walking at the same time	You should not text and walk at the same time You should not text and walk at the same time because you might walk into someone or you might walk into the road or walk to a tree or some other things
Always look up when crossing roads to see if there is any cars	Walk across roads without looking up for cars
Look out when you walk	Don't text and walk
You should always put your phone in your bag and not hold it in your hand	You should not put your phone somewhere laying around is not your house or Someone might steal it Put your bag in the boot not at the car seats
Look where you are going See if there are any cars coming on the road	Text when near roads

Year 6 – Poster 1	
1st question	
You need to be careful and watch where you are going and while crossing roads there are cars Don't leave it anywhere because someone could steal it Don't be distracted by your phone and not paying attention to your surroundings	
Crossing roads Cars (all vehicles); bikes Stop, look, listen If you have earplugs in, take them out Getting it stolen People Keep it close to yourself maybe put it in your bag	
Crossing roads Getting it stolen Being distracted by your phone and not paying attention to your surroundings	
You should only get people's phone numbers if you know them You shouldn't meet up with strangers on the phone	
To concentrate on the road when crossing put it down because of your surroundings	
Cars, buses, van, lorries, trucks, roads old people, dogs, disabled people, children, babies, bikes.	
Be safe list	
When crossing roads, stop, look and listen Be alert Walk the way you know Keep a safe distant from fire	Step out onto road without looking Look at your phone all the time Walk on the red signal Accept sweets from strangers Talk to strangers Play with fire
Look where you are going while on your phone When crossing roads stop, don't go on your phone and pay attention to the cars	Don't text while you are walking Don't cross the road on the phone Don't look at your phone all the time Don't talk to strangers
Look where you are going Call somebody like a grown up if you are lost	Don't stay on your phone so long or else you might go into a street you may not know
Look where you're going Keep your phone in your pocket and only use it when needed	Look at your phone at all times Always have your phone out Not looking at your surroundings
Beware of your surroundings Look where you are going	Text and walk Walk straight on a road
Look where you're going Keep your phone away Keep checking each direction when you cross the road	Walk on the roads Walk in front of cars Cross on bends Always have your phone on and out Don't look where you are going

Year 6 – Poster 2	
1st question	
Losing concentration of the road Getting it stolen Getting run over Getting it lost	
When you are crossing the road In case you bump into someone when you are walking That you don't fall or trip into a lake or just fall over	
You need to be careful about crossing a road because if you're looking down at your phone a car might come and you won't see it	
You need to be careful when you're crossing a road with a mobile phone because if you don't then you could get hurt by a car or motorbike	
Be safe list	
Look out when you walk Don't text and walk at the same time When you are walking in somewhere that is busy then go off your phone and be aware	Text and walk Don't look out when you walk When you are walking somewhere busy then don't look around

When crossing a road put your phone away If you need to text someone stand to the side of the pavement	Don't be texting and walking at the same time
Look when crossing a road Wait until there are no cars Put your phone away	Text and walk Walk without looking Play on your phone
Look when you're walking	Don't text while walking

Year 6 – Poster 3	
1st question	
You have got to be careful that you don't drop it If you do drop it then you might get smashed Have it in a safe compartment in your bag or pocket	
You need to be careful about crossing roads Bumping into things You need to be careful about thieves trying to steal your phone Or drop your phone	
To keep close to you and not let it be grabbed Not let anyone connect to your Bluetooth because they could get your personal information	
You need to look out for cars; Where you're going; And if you're listen to music in earphones you need to look, listen extra careful for cars	
That you're aware of your surroundings; And when come to a road look and concentrate on the road	
You need to be careful about crossing roads because you might not be looking where you're going Also you could bump into things and maybe someone might steal your phone	
Be safe list	
Don't text and walk while crossing the road because you could get hit by a car Or just be on your phone	Be on your phone while crossing the road
Not text while walking Listening to music while walking Make sure there is no cars coming	Text while walking Listen to music while walking Not make sure there is no cars coming
Look when crossing the roads Listen when crossing roads Look up from whatever you're doing and cross the road carefully	Don't look Don't listen Stay on your phone when walking across the road
You can look where you're going When you're crossing a road check for any cars passing	Cross a road before looking Don't text while walking
Look out for cars and objects and when you're crossing wait until the green man comes up and then cross	Don't text and walk because then you're always looking down and focusing on that and not what's in front of you Don't cross on the red man
Stop going on your phone when your crossing roads Keep your personal information to yourself Only talk online to people that you know Be careful so you don't bump into things	Don't have your phone in a position where it can be easily stolen Don't give out your personal information Don't talk to strangers online Don't drop your phone bump into things because you're on your phone

Year 6 – Poster 4
1st question
If you're crossing a road put down the phone so it doesn't distract you If a car is coming stop stand still
If a car is coming or not Or when to stop at a road Don't bang into anything

You need to be careful when you 're walking and that you stay on a path and look before you cross roads Be careful that you don't walk into anyone
You aware of things around you You don't get distracted Watch where you're walking Turn it off while crossing roads
Dropping it Not playing on it while crossing roads
Don't bump into anyone Don't walk or cross onto a road when you are looking at a phone Don't get distracted when you are crossing a road

Be safe list	
Don't use your phone Look if a car is coming first	Play on your phone and don't look up
Don't get distracted by your phone when you're walking Look around for people that might crash into	Walk with your phone in your hand Crash into people
Watch out things around you Be careful of lampposts Walk slower so you have more time to react to objects around you	Stare at your phone screen and be engrossed in a game *or text
Turn your phone off Look where you walk Don't bump into people Don't text and walk	Walk in front of a car while it is moving Bump into people Trip over things Get distracted
Put down your phone when you're walking don't text and walk Look out when you cross the road and look both ways	Have your hood on when you cross a road it can block your eyesight Walk across the road without looking or while you're on your phone
Turn off any devices while walking Always look where you're going Look both left and right to be sure that no cars are coming when you cross	Don't get distracted while crossing road Don't walk and text Don't listen to music while crossing

Year 6 – Poster 5
1st question
Don't drop it Don't look at the screen and walk If you have earphones take them off when you're crossing the road
You can't text while walking you might trip You could drop and break it It could be stolen
Don't drop it Don't look at it while crossing roads
Cars; curbs; sighs; roads; vehicles; rivers
You should look where you are going so you don't fall over or crash into anything and turn off your phone whilst crossing roads so you can pay attention
You need to be careful of the roads What is in front of you

Be safe list	
Look at the road Turn your phone (off?) at roads	Text and walk Don't leave your earphones in Don't run across roads Don't stop in the middle of a road
Look around you're not on your phone	Stay on your phone while walking or crossing roads Leave your earphones in while crossing roads
Look ahead of where you are going Listen when crossing Press the buttons when traffic is on	Be occupied on a game on your phone Wear headphones

Always pay attention when crossing a road Look both ways Listen for cars Walk	Play on your phone Run across the road Chat while crossing a road Listen to music Not look Only look one way
Turn your phone off Look where you're going Walk Look both ways before crossing roads Listen for cars Take earphones before crossing roads	Text and walk Run Not pay attention whilst crossing roads Listen to music crossing roads
Turn off phone Cross at crossing	Text while walking Cross near corners Run across a busy road Keep your earphones on whilst crossing Jay (?) walking

School C's answers

Year 3 – Poster 1	
1st question	
When you're on the road When you drop your phone Calling a stranger	
Don't drop your phone Watching for robbers	
Calling someone you don't know	
Not dropping the phone Watching for other people Crossing the road Calling someone you don't know	
You have to listen to the cars It is dangerous to listen to your phone when you're crossing the road	
The cars are really fast so where you pass	
Not knock anyone over Not to drop the phone Not to run Not to walk in the road if you're in the street Not to trip over	
Be safe list	
Do not pay attention Do watch what other people are doing	Don't text and walk
Do look left and right Stop Look	Not to walk with your phone Not to talk Don't ride your bike when you cross the road
Focus where you're looking Don't text Text when you get home	Don't go on your phone and text while you're on the road
Stop, look and listen Don't text and walk	Text and walk Listen to people
Look where you are going Look for robbers	Text and walk
Look where you are walking Look out for people, slippery stuff, puddles	Don't look at your phone Don't text and walk

Year 3 – Poster 2	
1st question	
You need to hold the phone with both hands	
To watch where you are going Make sure you don't drop it Someone might steal it You might lose it You might have an accident It might brake It might disappear	
People in front of you Don't drop it Not breaking it	
Look where you're going Not dropping it; Not breaking it; Not losing it Cyber bullying	
Concentrate on the road Look out for cars, bikes and scooters Don't drop it Don't turn it off and on	
To watch where you're going Make sure you don't drop it Might lose it Might have an accident It might break	
You could drop it and it could dial someone not very nice (drawing of two people talking, one really angry)	
If you are talking on the phone whilst crossing the road and you aren't concentrating you could get run over	
Be safe list	
Look out when you walk	Text while walking
Don't text and talk when you are crossing the road Don't text when you're walking through your house	Don't break the rules of don't text and walk
Look out when you walk	Don't do it when you are in a car Don't chat to people you don't know
To not text when walking To look out when walking Don't use a phone in a busy place	Text while walking To not look where you're walking Use a phone in a busy place
Look out when you walk	Don't text and walk
Don't text when you walk across the road Don't put your phone on in a plane	Text across the road
Look out when you walk Look out for people Don't use phone in busy places	Try not to text when busy
Look before crossing the road Look out and don't text while walking along	Don't share your personal information with people you don't trust

Year 3 – Poster 3
1st question
Don't crash into something It's dangerous
Somebody you call might be a stranger
You need to be careful about the road and crossing You might have contact with a car
Damage Electricity Die – kill yourself Brake your phone Hurting other people
Don't cross a road without putting phone down

Crossing the road Where your walking too
When you're walking around on your phone where might be a stranger and they might kidnap you
Don't cross into a car Watch what is happening

Be safe list	
Look out and don't bump into people (Possibly) don't fall (or don't focus)	Don't drive
Stop when you at the road and look both ways	Don't text and play games
Put your phone away whilst walking To Look while walking Don't text people	Keep your phone out Focus on people Text
Ignore strangers If you're waking your dog keep your eyes on the dog	Talk to strangers Text whilst walking Cross the road without looking
Stop before a road and check both ways Look out when you walk	Don't text or do anything while you walk Text and walk
Look out when you walk Don't text and walk Don't go on your phone	Don't look when you're walking Text and walk Go on your phone
Only use if it's a emergency Text and phone people if you're 100% sure who it is	Don't do prank phone Don't text and walk
Only use it when it's an emergency Put it away Do it later	Walk into a lamppost

Year 3 – Poster 4
1st question
You can be electrocuted Don't lose it
Don't drop it Don't let children have it
You could bash into someone Watch where You could get hurt You could lose it; It can smash
Do be careful to not drop the phone
To not drop it and be careful Drop the phone Watch where you are going
Crash into people Not to drop it People don't steal it
Don't drop it Don't let your children get it

Be safe list	
Look out when you're texting	Walk with a phone
Keep your phone in you're pocket Look out	Walk and text
Look when you walk	Don't text and walk
Look where you walk	Don't text and walk
Only text when you're sitting down Look where you're going	Text and walk No calling on the street Don't bump into anything
Look at the pedestrians not at your phone	Don't walk with your phone

Look left and right when you cross the road Look when you walk Keep phone in pocket Don't text in the car Don't eat in the car	Don't look when you cross the road Don't look when you walk Text in the car Eat in the car

Year 3 – Poster 5	
1st question	
You need to be careful in case you trip and the phone can cut your ear You need to be careful in case you don't see cars	
You have to be careful when walking with a phone because if drop it glass can break and it make electricity strike And children use phones for a long time then the phone will get hot and burst and explode and then there will be blood everywhere	
Damage your phone Looking out for people Always face the right ? don't face down You need to look out for cars Breaking people's cars Don't look at it Vehicles	
When you're walking around with a phone you should make sure no one can take it from you If you're texting on your phone you should look where you're going	
You need to be careful to look where you are going	
When you're walking around with a phone you need to be careful of roads Be careful of building sights especially children Rivers/ bridges / boats	
Cars; people; shops; pets; road; fall in nolse (?) building sights; children; rivers	
Be safe list	
Watch where you walk Always look at the traffic lights if green or red	Don't walk and text Don't walk and take selffies Don't let anyone try and distract you
Look up Look where you're going Stop! Look! Listen! And then cross Look out for cars when you cross Hold hands when you're crossing Always stay with your parents Make sure you look so you don't trip	Don't look at electronic stuff Don't text and walk Don't ever walk on the double or single yellow line because you could kill yourself or go into hospital
Walk instead of play on a phone Look at traffic lights Don't trip Don't go past red light	Play on your phone Walk in front of cars Trip Pass red light
Always wait and look if the traffic lights if they are green Look where you're going	Don't text while walking
Turn the phone of and put in your pocket or hold it sensibly	Don't walk and text Look when you walk Don't look at your phone while walk
We look where you're going Hold hands across the road Look when cars come Look for cars when you cross the road	Don't text and walk Don't hold hands while you run because you might fall
Look where you're going Wait for the traffic light, walk when it is green Look out when you walk	Keep your head in the phone Don't text and walk

Year 6 – Poster 1	
1st question	
Not looking and walking into a very busy street Hurting people when not looking Bumping into things Getting your phone taken from you Getting your money taken	
Walking into someone else Your surroundings	
Pickpockets Dropping it Not looking where you're going and getting hit by a car	
Pickpockets Other pedestrians if you're on your device Not getting too pre-occupied	
You might be pre-occupied with your phone so you won't look where you're going	
Be safe list	
Make sure you look out your surroundings	Don't text while walking Don't get pre-occupied Don't slip on something
Walking without a phone in your hand Look where you're going	Don't slip on a banana peel Don't text while you're walking Don't slip on a puddle Don't walk into a wall
Look where you're walking Put your phone away Wait until you're stopped and then go back on your phone	Don't slip on something Don't text while you're walking Don't get pre-occupied on your phone while walking
Concentrate on the world around you beware of your surroundings Put your phone away while walking	Don't get pre-occupied with your phone Don't trip over anything Don't text while walking

Year 6 – Poster 2	
1st question	
You need to be aware of your surroundings, especially when crossing the road You need to be aware of people; when you are walking around you need to be careful to walk into people Be aware of any cars and bikes	
When you cross the road; to make sure you are looking at the cars and not the phone Listening to the surroundings Be aware	
When you cross the road Other pedestrians Hearing what people say	
Look for cars Don't wear earphones so you can here if a car is coming Lookout for people that look dodgy	
Cars, when you cross the road starting at your phone. Or if you are listening to music always have an ear out Be aware of your surroundings Peoples, cars, bikes	
Be safe list	
Don't text while walking Look out when you walk Look before crossing Be sensible near the road Cross where there is a crossing Don't suddenly run across the road	Text while walking Look at your phone when you walk Mess around near road Not looking before crossing Don't cross where there is a crossing Suddenly run across the road

Don't text whilst walking Look out when you walk Always keep an eye out Look at where you are going Look at what you're doing not at your phone	Text and walk Stare at your phone whilst crossing a road
Don't text whilst walking Look when you're walking Check / be aware of your surroundings Put your phone away when you are crossing the road	Cross the road on your phone Keep texting whilst walking
Don't use your phone when walking/ crossing roads Keep your phone away when going anywhere so you don't get distracted Don't listen to music when crossing roads or walking anywhere Put your phone somewhere where it is not easy to get to ex.Your bag	Text and walk Get distracted by anything anyone might show you on their phone Listen to music – by listening to music you will not be able to hear up coming cars
Once you are out of the way you can text Look both ways before crossing once you have reached the other side of the road If you are wearing earphones / headphones take them off while you cross	Cross the road while texting Run across the road on your phone

Year 6 – Poster 3

1st question	
You should cautions when crossing the road with a phone You shouldn't be looking down at your phone when you're crossing the road Also, when you're at a train station you shouldn't even look at your phone because you could start walking forward and fall into the track Thirdly, when your at a bus stop, you have to be careful when looking at your phone	
Crossing the road Being aware with what is around you	
You need to make sure you look before crossing any roads and beware of what is around you	
Crossing the road Walking around water Other people Road works Potholes	
Roads Other people Lakes, bikes; cars; buildings; building sights; road works; pot holes	
Be safe list	
Look both ways when crossing the road Focus on the road when crossing the road Try and cross the road when you see a zebra crossing	Keep texting whilst crossing the road Phoning someone when walking across the road Do not phone anyone at a train station because you could fall into the track
Look before crossing the road Turn off your phone when crossing	Don't look before crossing the road Don't text when walking
Look before crossing roads Focus completely on the road and don't let anything distract you Try to only cross the road at zebra crossing	Keep texting whilst crossing a road Phoning someone whilst walking across a road
Don't text and walk Look out when you walk Look before you cross the road	Text when crossing the road Don't look out when you're walking Don't be on the phone while walking across the road
Be cautious around roads Look both ways Turn off your phone	Text and walk Text on a road Keep looking at your phone

Year 6 – Poster 4	
1st question	
Be careful when coming to roads Make sure you are securely holding it Don't wear earphones with loud volume Don't be distracted from roads Always look up and look where you're going	
Make sure it is secure in a safe place Be careful when there are roads Don't be distracted when you're near dangerous places (roads) Don't listen to music when you're crossing roads	
When you cross the road, you must put your phone away so you can concentrate on the coming traffic Watch where you are going so you don't bump into anyone Don't listen to music when crossing the road either because if you're eyesight is poor, than you can hear is traffic is coming Make sure it is in a safe place so it doesn't fall out on the road	
Cars/ vehicles The road Going into places you don't know Being careful of your surroundings	
The road: remember to stop using your phone when crossing The world around you: make sure you are able to see whatever you need to: people, trees, lampposts, etc. Not concentrating – going to places shouldn't. Be careful	
Look around you Don't wave it around Don't listen to music when crossing a road Follow the same road safety rules that you would without one Look out for cars	
Be safe list	
Look both ways when you cross the road Don't give your personal details to someone you don't know Be sensible whilst on the internet Be careful where you track. As you might trip down the curb and get killed by a car	Walk along the road with your phone Talk to strangers on social media Don't have apps that are not categorised in the correct age group for you
Always look forward/ look what is coming Hide personal information Stop, look, listen when coming to busy roads Be careful with the app you are buying When upset by anything tell someone you trust	Text and look down Give away your location Walk straight across some roads Don't talk to someone you don't know Meet up with strangers on social media
Look directly up when walking Look where you're going to cross the road	Don't walk when you are looking at your phone Don't tell people where you are going on a social media
Look out when you walk Look up Look out for cars Walk sensibly	Don't text and walk Don't accept food or drink from strangers Don't walk off with strangers Don't run
Look at your surroundings Look up Look out for holes in the ground	Don't text and walk Don't look down
Stop texting Look up Don't hit the tree Stop walking Don't text while walking	Hit the tree Keep on texting Don't look up Walk Text while walking

Year 6 – Poster 5	
1st question	
Always make sure you have it on you Be careful when you cross the road	
You need to be careful because if you are walking around with a phone and crossing the road there is a high chance of having an accident	
Be careful you don't trip Make sure it is in a safe place	
Don't bump into strangers you look where you're going People don't steal your phone Don't cross the road while on the phone	
Don't bump into people Don't cross the road looking your phone Your phone doesn't get stolen	
Be careful when crossing a road with it and don't always be looking at it Make sure it is in a safe place Try not to look at it the whole time	
Be safe list	
Only use your phone when necessary Take head phones out Don't cross a road with your phone Look and listen when crossing a road	Don't text and walk Looking at your phone whilst crossing a road Have earphones in because you cant hear traffic
You should turn your phone off when crossing the roads Cross near roads with and adult	Text and walk Wear headphones
When crossing the road, don't carry on texting look before you cross Look before you cross	Text and cross the road Text and drive Text and walk
Look out when you walk Take your headphones out when you cross a road Be with and adult	Don't text and walk Have earphones I when you are crossing a road
Look where you are going Be with an adult Take your headphones out so you can hear for cars	Don't text and walk Don't have headphones in when walking
Put your phone away Look when crossing the road Take your earphones out Listen Look Be careful	Look at your phone when walking and crossing the road Have earphones in because you cant hear the traffic Don't text and walk Text and drive Call and drive

Appendix 3

Number of children's answer to the Be Safe list in the two schools of the second study

Table 68: Comparison of school B's children's answers in the second written task, divided into poster groups and the two school years participating in the study. Number of answers over number of participants in each group (i.e. x/y, where x= number of answers and y= number of children in the group), organised from high relation with the poster's topic (top) to low relation with the poster's topic (bottom).

Number of children's answers to the second written task at School B										
Type of Advice	**Poster 1**		**Poster 2**		**Poster 3**		**Poster 4**		**Poster 5**	
	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6
Drawing references	1/2	0/6	0/2	0/4	0/3	0/6	2/4	2/6	0/6	0/6
Take care advice	3/2	16/6	6/2	5/4	3/3	5/6	3/4	8/6	4/6	8/6
Avoidance actions	0/2	7/6	1/2	3/4	1/3	0/6	2/4	3/6	2/6	1/6
Consequences	0/2	0/6	0/2	0/4	1/3	2/6	2/4	3/6	3/6	0/6
Don't text and walk	2/2	3/6	3/2	4/4	2/3	7/6	3/4	9/6	6/6	6/6
Not suitable for children	0/2	0/6	2/2	0/4	0/3	0/6	0/4	0/6	0/6	0/6
Personal safety	0/2	0/6	0/2	0/4	0/3	4/6	1/4	1/6	1/6	6/6
Device safety	0/2	0/6	0/2	0/4	0/3	2/6	0/4	0/6	0/6	0/6
Undetermined	0/2	3/6	0/2	2/4	0/3	2/6	0/4	0/6	0/6	8/6
General advice	0/2	2/6	0/2	0/4	0/3	0/6	0/4	1/6	0/6	1/6

Table 69: Comparison of school C's children's answers in the second written task, divided into poster groups and the two school years participating in the study. Number of answers over number of participants in each group (i.e. x/y, where x= number of answers and y= number of children in the group), organised from high relation with the poster's topic (top) to low relation with the poster (bottom).

Number of children's answers to the second written task at School C										
Type of Advice	**Poster 1**		**Poster 2**		**Poster 3**		**Poster 4**		**Poster 5**	
	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6	Year 3	Year 6
Drawing references	2/6	4/4	0/8	0/5	0/8	0/5	1/7	1/6	0/7	0/6
Take care advice	4/6	6/4	6/8	11/5	4/8	7/5	8/7	12/6	8/7	6/6
Avoidance actions	2/6	4/4	0/8	4/5	6/8	3/5	3/7	0/6	4/7	3/6
Consequences	0/6	1/4	1/8	0/5	4/8	0/5	1/7	1/6	3/7	0/6
Don't text and walk	6/6	4/4	8/8	6/5	7/8	6/5	6/7	7/6	8/7	10/6
Not suitable for children	0/6	0/4	1/8	0/5	1/8	0/5	1/7	0/6	0/7	3/6
Personal safety	0/6	0/4	2/8	3/5	2/8	0/5	1/7	4/6	1/7	0/6
Device safety	1/6	0/4	0/8	0/5	0/8	0/5	0/7	0/6	0/7	4/6
Undetermined	5/6	0/4	3/8	1/5	5/8	3/5	1/7	2/6	3/7	1/6
General advice	1/6	0/4	0/8	0/5	1/8	0/5	1/7	2/6	4/7	2/6

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