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Narratives and Critical Literacy in Health Websites for Children

Abstract I: Il presente studio intende analizzare, dal punto di vista delle competenze critiche, le narrazioni all'interno di siti web di tipo *edutainment* che hanno l'obiettivo di informare i bambini sulla salute e il benessere. Queste narrazioni sono costruite da sviluppatori adulti con l'obiettivo di attirare l'interesse dei bambini, promuoverne l'empatia e spingerne la partecipazione.
I risultati sono presentati sottolineando gli aspetti chiave e le strategie pertinenti adottate da bambini per interpretare i testi multimodali, considerando in particolare: le capacità critiche di bambini di diverse età; lo sviluppo di strategie per l'interpretazione del significato; e le strategie adottate per superare la confusione semiotica o la possibilità di errori di interpretazione che potrebbero limitare la promozione di interconnessioni di uguaglianze.
Questo contributo intende aggiungere nuovi dati alla comprensione del ruolo che la narrazione gioca nei siti web creati da adulti per dare informazioni ai bambini; inoltre, intende promuovere lo sviluppo dell'autonomia e della capacità multisemiotica nei bambini. Di conseguenza, lo studio promuove anche l'ecologia comunicativa attraverso diverse generazioni e comunità di pratica. Una migliore costruzione dei testi multimodali da parte degli adulti può portare ad un miglioramento dell"empowerment', della partecipazione e dell'azione sociale nei bambini. Lo studio analizza anche lo sviluppo del metalinguaggio e la consapevolezza dei percorsi di lettura da parte dei bambini, dunque il loro sviluppo critico e digitale. Le linee guida e i best practices sono presentati per favorire l'empowerment del bambino.

Abstract II: This paper deals with the story-telling narratives that are created in *edutainment* websites that inform children about health and well-being, from a critical literacy approach. These story-telling narratives are employed by the website designers to capture the interest of children, to nurture empathy and to encourage participation.
The research results are presented highlighting key points and relevant strategies for text interpretation by the children, considering: the critical literacy of children of different ages; observing the development of strategies for interpretation of meaning; and the strategies adopted to overcome semiotic confusion or possible misinterpretation that could hinder the aims of fostering equitable interconnections.
This paper furthers understanding of the role story-telling plays in websites designed by adults to inform children and aids safe child autonomy and mul-

tiliteracy skills. This fosters communication ecology across generations and communities of practice. Better multimodal text construction that involves both adults and children, rather than just adults, can lead to greater child empowerment, participation and social action. Child metalanguage and child recognition of reading pathways in-line with their digital and critical literacy development is also analysed. Guidelines and best practices for greater child empowerment are also presented.

Introduction

In this paper, the findings and conclusions reached during an Italian nationally financed project called MACE (Multimodal Awareness for Child Empowerment) are presented. It specifically refers to the data dealing with *edutainment* websites that inform children about health and well-being, using a critical literacy approach (Perez Tornero & Varis 2010). It focuses on literacy, skills and competence (Ala-Mutka 2011; Unsworth 2011; Jewitt 2012; Jewitt, Bezemer & O'Halloran 2016) with literacy considered as a social phenomenon (Jones & Hafner 2012) whose levels of competence are connected to levels and strategies of social participation and action and mastering a 'multiplicity of discourses' (Cope & Kalantzis 2014).

The analysis focuses on the critical literacy of children of different ages (Ilomäki, Kantosalo & Lakkala 2010) when dealing with informative or pedagogic multimodal texts observing the development of strategies for interpretation of meaning (Ananiadou & Claro 2009) and the strategies adopted to overcome semiotic confusion or possible misinterpretation.

These observations, analysis and results are aimed at promoting safe child autonomy and multiliteracy skills (Tyner 2014) and fostering communication ecology across generations and communities of practice by contributing to better multimodal text construction paving the way for greater child empowerment through enhanced participation and social action. Metalanguage used by children (Baldry 2011, Baldry & Thibault 2006) is also considered along with how children recognise reading pathways (Hamston 2006), this is done with child digital and critical literacy development in mind.

Guidelines for best practices for greater child empowerment based on these results are also presented. The paper and guidelines contribute to the dissemination of methodological tools for future projects in relation to best practices so as to promote awareness of problematic issues when dealing with multimodal texts created to protect children's well-being and health.

The research questions deal with the investigation of children's perception and strategies for extracting meaning from websites about health and well-being. The main questions are: what is the level of critical thinking and multiliteracy skills of children from 8-13 years old when dealing with multimodal texts in ICT-mediated edutainment websites dealing with health and well-being? How can ICT-mediated texts actually facilitate interconnections, creative skills and interactivity (Baron 2008) in a safe but autonomous way? What is the suitable, age-related, strategy to develop greater child critical awareness of their multi-

literacy and multimodal skills, fundamental in the construction of their identity in a social group?

The Theoretical Framework

Narrative is central to human experience, and a key way that experience is made meaningful. Throughout its development, it has provided a way for shaping children's experience, reflecting how they fit into their society, and helping them construct meaning for themselves. As narrative evolved to find its rightful place in the mix of technology, education, and entertainment within children's print culture, so it is evolving within the rapidly developing digital environment. In *Narrative Knowing and the Human Sciences*, the psychologist Polkinghorne discusses how narrative is central to human experience. He says that narrative is the primary form by which human experience is made meaningful (Polkinghorne 1988: 1). He also identifies that narrative has to do with activity rather than object, not the thing but the act (Polkinghorne 1988: 4). Morson and Emerson 1990 report that the critical literary scholar Bakhtin describes narratives as dialogues between people, between cultures, between different times, that they are not only texts but that human participation is integral, so dialogues involve writers and, critically, they involve readers. In the case of the digital environment, they involve users. Each medium, oral tradition, print, radio, film, television, has made its own contribution to the storytelling tradition. Each influences, borrows from, and depends on, the other media traditions. Computers were originally text-based, and much of the information they contain is still text-based; but image, sound, and animation quickly took their place alongside text, and many narrative techniques were borrowed from the television tradition. This concept is well expressed by Bolter (1996): the computer as hypertext, as symbol manipulator, is a writing technology in the tradition of the papyrus roll, the codex, and the printed book. The computer as virtual reality, as graphics engine, as perceptual manipulator, belongs to and extends the tradition of television, film and photography, and even representational painting. When children use a computer, they have before them, combined, all of the storytelling media of the past. This creates for a rich experience. It is part oral tradition, part print tradition, part television tradition, all integrated to create a fascinating whole. It can also create confusion and misinterpretation.

The theoretical basis for the research and analysis revolves around Multimodal Discourse Analysis (MDA), Critical Discourse Studies, Multimodal Awareness and Literacy. MDA, developed from Hallidayan Systemic Functional Linguistics (SFL), is used to analyse the meaning-making resources in texts which are considered as the synergic co-deployment of a variety of verbal and non-verbal affordances: written language; oral components (including sound and music); film components (rhythm, editing, layout, etc.) (Baldry & Thibault 2006; Bateman 2008; Kress & van Leeuwen 2006 [1996]; Martinec & van Leeuwen 2009; Unsworth 2008; van Leeuwen 1999; Ventola *et al.* 2004).

Halliday places language at the heart of a multi-layered system, where each outer layer influences the next layer. The system works within the context of situation and ultimately the context of culture. When the outer and most influential level of a communication system is the culture within which it occurs. Halliday links contexts of situation to three social

functions of language: enacting speakers' relationships; construing their experience of social activity; and weaving these enactments and construals together as meaningful discourse. Accordingly, contexts of situation vary in these three general dimensions. The dimension concerned with relationships between interactants is known as Tenor; that concerned with their social activity is known as Field; and that concerned with the role of language is known as Mode. Halliday has characterised these three dimensions of a situation as follows: 'Field' refers to what is happening, the nature of the social action that is taking place; what the participants are engaged in; 'Tenor' refers to who is taking part, the nature of the participants, their statuses and roles; what kinds of role relationship are obtained, including permanent and temporary relationships; 'Mode' refers to the role language is playing in the interaction, what the participants are expecting language to do in the situation; the organisation of the text, and its function in the context (Halliday 1985-1989: 12).

Taken together the Tenor, Field and Mode constitute the Register of a text. That is, from the perspective of language, we will now refer to the context of situation of a text as its register. As register varies, so too do the patterns of meanings we find in a text. Because they vary systematically, we refer to Tenor, Field and Mode as register variables. As language realises its social contexts so each dimension of a social context is realised by a particular functional dimension of language. Halliday defines these functional dimensions as the 'metafunctions' of language: enacting relationships as the interpersonal metafunction; construing experience as the ideational metafunction; and organising discourse as the textual metafunction. Relations between register variables and language metafunctions are as follows:

Register	Metafunction
Tenor ('kinds of role relationship')	interpersonal 'enacting'
Field ('the social action that is taking place')	ideational 'construing'
Mode ('what part language is playing')	textual 'organising'

Critical Discourse Studies and Multimodal Awareness are also research areas stemming from SFL offering interpretation tools which are particularly relevant to the field of media discourse and the investigation of power relations and ideology related to e-community construction and accessibility (Caldas-Coulthard & Iedema 2008; Fairclough 2003; 2006; Wodak & Koller 2008; Lassen *et al.* 2006; van Dijk 2008).

MDA proposes a detailed framework for analysing how meaning is made focussing on the relationship and interaction with society. Systemic Functional Theory considers all communication acts as being multimodal. MDA also considers all communicative acts as being influenced and shaped by the societal and cultural contexts in which they are produced. Therefore, implicitly, they reproduce the values of the societal and cultural contexts that they are a product of, thus disseminating and preserving those cultural and societal values.

In this paper, literacy is considered as *mediated action* (Scollon 2002) and so is linked to the appropriation of tools to accomplish particular social practices. *Critical multimedia literacy* is a crucial element: as Lemke stated "Web pages and Websites are valued today for their integration of text, images, animations, video, voice, music, and sound effects […] Website authoring is the new literacy of power" (Lemke 2006: 4).

As *literacy* is considered to be a *social phenomenon* and not only a set of cognitive or technical abilities (encoding or decoding spatial layout, organisational structure, pictures, etc.) (Jones & Hafner 2012) so communities of practice (CoP) become instrumental in codifying norms and participation. This means social competence is required to use *multimodal literacy collaboratively* (Rheingold 2012a, 2012b). *Multiliteracies* are considered as new literacies including multimodal awareness in the context of text production and fruition (Cope & Kalantzis 2009a, 2009b, 2014). Cope and Kalantzis (2008: 202) emphasise the power of learning environments that '[o]ffer and encourage multimodal expressions of meaning'. Pre-digital notions of literacy have been further advanced with the advent of digital tools and media developments. This process will inevitably continue and attempting to keep one definition that is applicable to all future contexts would not be possible as it would lose its relevance as new contexts develop. UNESCO suggest that as new situations develop so new levels of information literacy may be needed (Catts & Lau 2008).

It is important to understand (critical) literacy as a basic notion of understanding information and communicating with culturally agreed symbols and patterns is central to all the other types of literacies, including ICT, Internet, information and media literacy. ICT literacy is the narrowest digital concept, it concerns technical know-how and computer and software proficiency; Internet literacy is ICT literacy plus its successfully usage in networked media environments; information literacy and media literacy concepts are very similar. However, information literacy is more focussed on the sourcing, arranging and processing of information; media literacy is more focussed on the skills relating to the interpretation, use and creation of media for individual benefit and participation. Critical thinking is central to both information and media literacy as it involves interaction with Communities of Practice.

Digital literacy, as originally defined by Gilster (1997), is the most far ranging notion, incorporating the central characteristics of the other concepts, but also having the added aspect of employing digital tools responsibly and effectively for individual task execution and development. This is actively advantaged by people networks. Information literacy and media literacy cover both digital and non-digital domains. However, their main characteristics are highly pertinent to the digital domain especially in terms of critical thinking.

When dealing with literacy and critical multimodal awareness in children, attempting to stick to one concept definition of literacy for the development of a framework can create more obstacles than it does in providing solutions. What is helpful is the acknowledgment of the fundamental characteristics of all the most central concepts. Martin states that looking for "one literacy to rule them all" is pointless (2006: 18). Bawden (2008) focusses on explaining the notion instead of defining it in relation to other notions. Martin concludes:

> A multitude of literacies may be confusing and inconvenient, but it represents the reality of social life, where perspectives and situations vary immensely and are constantly changing. Literacies point to perceptions of need and empowerment in society, and a changing society will inevitably continue to create new ones (2006: 18).

In this paper, media literacy is central to the analysis and can be considered as the skills needed to: access, analyse and evaluate the impact of images, sounds and messages

in contemporary culture; proficiently communicate by means of the media available; increase awareness of messages communicated via this media; aid recognition of the methods adopted by these media to filter perception and opinion, shape culture and have an impact of the individual's decision-making processes; allow for critical analysis development and creative problem-solving skills; media education is a fundamental right akin to freedom of expression and the right to information, and is central to the maintenance of democracy; media literacy is necessary for full and active citizenship (Pérez Tornero 2004).

The ability to use media, to think critically, to assess information and ultimately to participate and communicate in a creative way are skills the individual must develop. There is a hierarchy of skills within media literacy: a pyramid structure with skills development going from bottom to top: from media availability, to media use, to critical understanding to communication. The lower levels need to be mastered before the higher levels. Thus, there is a distinction between skills connected with access and use; skills connected to critical understanding; and skills dealing with communicative production (Perez Tonero & Varis 2010). These are the abilities necessary to nurture critical skills and also are a foundation for empowered and creative communication. The link has now been made between digital literacy, media literacy, critical thinking, information selection and processing, problem-solving; communication and interaction skills development, civic participation leading to civic responsibility and active citizenship.

Data Gathering Methodology
The aim of the study was to investigate children from the key literacy development age-range of 8-13 years, looking specifically at: 1) critical thinking and multiliteracy skills when dealing with multimodal texts in ICT-mediated edutainment websites; 2) how ICT-mediated texts can actually facilitate interconnections, creative skills and interactivity (Baron 2008); 3) what is the suitable, age-related, strategy to develop greater child critical awareness of their multiliteracy and multimodal skills, fundamental in the construction of their identity in a social group.

With these aims, study groups and research tools (questionnaires and semi-structured interviews) were developed. Over 180 children, from 8 to 13 years old, in three English language schools in North East Italy were involved in the whole project. The part dealing with health and well-being, the results of which are reported here, involved 86 children from one school, the Trieste International School. All these participants had informed written consent of the parents or guardians. The medium of instruction in the school is English with mainly native English speaker teachers, but a majority of the pupils come from non-English backgrounds. The school is the only school in Italy to issue school-leaving certificates which are fully and legally recognised by Italian law, a law that was designed for the school.

Before interviewing and data collection took place, a corpus of websites and educational videos were gathered and studied by the Udine research team. The criteria for selection was that the material was published by official institutional sources *i.e.* governmental agencies, public institutions or private institutions with a public accountability; the material was intended for children 8-13 years old; and that the communicative aims of the material were

specifically described by the institution that published it. A shortlist of possible material was drawn up and discussed with the teachers of the Trieste International School to confirm suitability. Draft questionnaires and semi-structured individual interviews were designed, and then shown to and discussed with the teaching staff of the school, after which they were later refined incorporating the teacher feedback. The definitive questionnaire (see Annex 1) and semi-structured interviews probed for understanding and to identify the strategies the children adopted to decode the multimodal texts. These interviews probed for the critical literacy aspect which dealt with the other possible ways the same thing could have been communicated and what presuppositions were made in the choices of the published material. This then lead to questions probing metasemiotic awareness and the description and analysis of the semiotic system that had been employed.

The creation of the research tools applies Lemke's notion to education material for children that any

> enumeration of the contexts of use of multimedia texts must include not just those of production and circulation, but also those of the local end-user. A complete social semiotic analysis would therefore add interview reports and on-site field notes and recordings of how people actually make use of and interpret [hypermedia texts] (Lemke 2002: 41).

The questionnaires and semi-structured interviews first focused on the home page and then moved on to the entire website. Emphasis was given to the homepage as it is the highest level of the website hierarchy and is the point of departure through which the children orientate themselves around the entire website. As Djonov says "the homepage can be interpreted as a website's highest-level macro-Theme (Martin 1992) because its function, following website usability research (cf. Krug 2000; Nielsen & Tahir 2002; Pearrow 2000) is to offer users access to the website's main sections and orientate them to the website by allowing them to predict how the website is organised and what information and activities it has to offer" (Djonov 2008: 221).

The observations and results from the questionnaires and semi-structured interviews allowed researchers to compare what meaning children of different ages and levels of media literacy were able to elicit from the homepage, and probed the strategies adopted to reach those meanings. The researchers then compared that first assessment to the meanings elicited by the same children from the website as a whole. The correspondence in assessments by various children could also be considered a gauge of website coherence. The children's interpretation of meaning of the homepage and then the whole website was then assessed as to whether, and to what extent, it matched and satisfied the aims of the website creators that was stated in their mission statements and descriptions of their aims.

After material selection had been made, and the questionnaires and semi-structured interviews finalised, the Udine research team carried out the research. The children were organised into groups according to age, with an equal number of boys and girls in the semi-structured interviews. The other areas of research, which are not reported in this article, focussed on ecology discourse (Bortoluzzi 2017) and citizen's rights (Vasta & Trevisan

2017). These other two research areas of the same project followed the same methodology, but the questionnaires and semi-structured interviews were slightly modified for the specific websites and videos used in each school and age group. The questionnaire dealing with the 'Health' material is included in the annexes (Annex 1). A questionnaire was also developed for the teachers to answer. All questionnaires were administered on paper and individually filled in by pen. The health websites chosen for analysis were:

Websites
8-10 year olds: Scrub Club (NSF International Public Health and Safety Organisation); http://www.scrubclub.org/home.aspx
10-11 year olds: Body and Mind (Centre for disease Control and Prevention); www.bam.gov
11-13 year olds: Kid's Quest (Centre for disease Control and Prevention); http://www.cdc.gov/ncbddd/kids/index.html

The procedure for gathering data was identical for all groups. The schools assigned one hour of class time for each class to participate in the study. In this hour, the pupils were put in groups of two and each pair had access to one computer. The children were then introduced to the relative website homepage, asked to 'study it' without clicking any hyperlink or accessing other pages. They were then asked to fill in the questionnaire relating to the homepage. They were then given the opportunity to explore the whole website and then answer the questions relating to the entire website.

The children were monitored at all times by researchers and teachers who offered advice or further explanation if needed and ensured the children kept to the time limits. Then six children per class, three girls and three boys, were chosen by the teachers as representative of a range of cognitive and literacy competences. These children were individually interviewed by the researchers using the semi-structured interview scripts, recorded in accordance to the European Commission guidelines on ethics in social sciences and humanities research. The aim was to further develop and clarify the written answers. In total, 86 pupil and 6 teacher questionnaires were completed, and 36 interviews were recorded. All the data was transferred by the researchers from the paper and pen questionnaires into LimeSurvey and analysed. LimeSurvey is a free and open source on-line statistical survey web app. As a web server-based software it enables users using a web interface to develop and publish surveys, collect responses, create statistics, and export the resulting data to other applications.

Data Analysis
When the children could only look at the homepages, they were asked the question: "What is the website about?" The results reported in Table 1 show, unsurprisingly, that there was increasing correlation with age, between the interpreted meaning by the children from the homepage and the meaning of the website creators (as stated in the mission statements and 'about' section of the websites). According to these results, there was a marked increase in this correspondence around the age group 9/11 years old. This table reports corresponding and complete answers.

Tab. 1. Corresponding and Complete Interpretation of Homepage.

School grade and age group	Percentage
Gr 3 / 8 years	21.43%
Gr 4 / 9 years	71.44%
Gr 5 / 10 years	17.65%
Gr 6 / 11 years	78.57%
Gr 7 / 12 years	81.25%
Gr 8 / 13 years	90%

This is more evident in Table 2 which reports the results of corresponding complete and corresponding incomplete answers compared to misinterpretation and no answers. The results suggest that interpretation of meaning from complex multimodal texts, in line with web designer's aims, increases with age. That is to say it develops alongside cognitive development, experience and media literacy.

Tab. 2. Corresponding and Incomplete compares to Misinterpretation of Homepage.

School grade and age group	Corresponding but incomplete	Misinterpreted or no answer
Gr 3 / 8 years	35.72%	64.28%
Gr 4 / 9 years	78.57%	21.43%
Gr 5 / 10 years	64.71%	35.29%
Gr 6 / 11 years	85.72%	14.28%
Gr 7 / 12 years	87.50%	12.50%
Gr 8 /13 years	90.00%	10.00%

Table 3 reports the results to question 2 of the questionnaire "How do you know what it is about". The younger the child, the more emphasis was given to the interactive elements of the homepage (games, moving dynamic images, sound) to extract meaning. To put that another way, verbal resources (the written word) seems to become more important in meaning extraction alongside cognitive development. The results suggest that emphasis on non-pertinent interactive elements on the homepages created confusion and misinterpretation of meaning among younger users and less confusion for the older users. This suggests that different reading paths should be constructed for different age groups with great consideration of the impact the interactive elements will have of the central message, especially for young children.

When interviewing the children, there was a computer placed in front of them with the homepage they had studied on the screen. When asked to further explain the reasons for the first answer ("What is the website about?"), it became clear that their attention was drawn to the moving, flashing images, videos, images with sound effects and banners. The confusion occurred in the younger children as they did not have the critical skills to omit these distracting elements from their interpretation of the central message of the website.

When these elements had little or nothing to do with the central themes of the website they detracted the child's attention and created confusion. There was a lack of cohesion between website content and pertinence of dynamic elements on the homepage, for the younger age groups in this study. We termed this phenomenon 'semiotic noise'. By this we mean the semiotic overload that potentially complicates the decoding of the text.

Tab. 3. Interpretation through integrated semiotic channels, emphasis on interactive elements.

School grade and age group	Percentage
Gr 3 / 8 years	71.43%
Gr 4 / 9 years	42.86%
Gr 5 / 10 years	64.71%
Gr 6 / 11 years	42.86%
Gr 7 / 12 years	37.50%
Gr 8 / 13 years	0.00%

Semiotic noise became more significant the worse the salience balancing became. Salience, in the field of multimodality, refers to the different degrees to which elements attract the viewers' attention. By "salience balancing", we intend the coherence of the verbal and non-verbal cues in these complex multimodal texts to communicate the intended message to the intended age group. To achieve this, the author of the text must have a clear idea of the reading path the reader will choose.

These results suggest that the reading path will depend on the age, cognitive development, critical thinking skills and media literacy of the reader. Although no gauge was created to measure salience balancing, it became apparent when a number of students misinterpreted meaning for the same reasons.

This literacy development in the children meant that at around 9-11 years old they could start to extract meaning, understand organisation and orientate themselves well from interpreting the homepage. It was also observed, and will be discussed more fully later, that the older children with greater media literacy had developed such mastery in this exercise, that they had the confidence to explain where the 'mistakes' were in the homepage design using very advanced metalanguage. They not only recognised the genre they had the patterns so well codified that they felt they could criticise the website designers. Their metasemiotic awareness was highly developed in this medium. The issue of genre and genre recognition is central to critical thinking and empowerment. However, genre in websites is more complex than in other media contexts as the generic structure potential is much greater as there is the possibility to draw from (and overlap) many different generic traditions: visual, verbal, spoken, written, and so on. Baldry and Thibault look into the issue of genre, in the traditional sense, and consider its applicability to hypertext: they acknowledge that a website will contain its own generic features; however, they postulate that hypertext is a 'hybrid' of *precursor genres* such as verbal text, visual images, and multimodal combinations of these (Baldry &
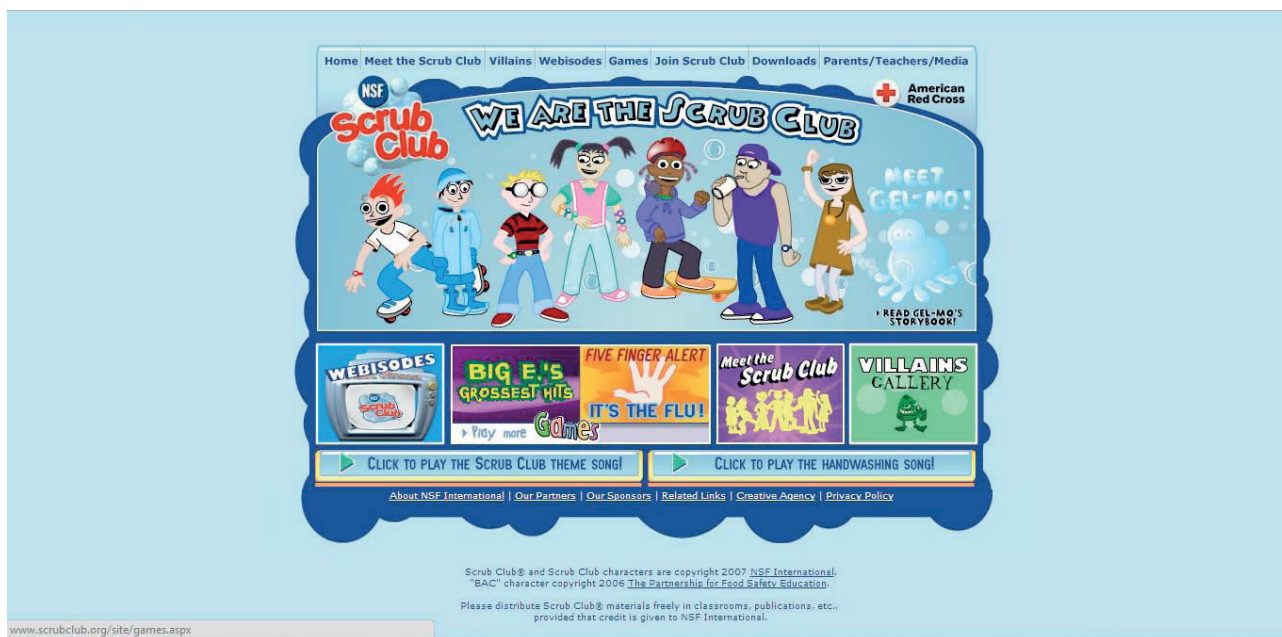
Fig. 1. The Scrub Club Homepage http://www.scrubclub.org/home.aspx.

Thibault 2006: 156). Lemke also describes hypermodality as "the conflation of multimodality and hypertextuality. Not only do we have linkages among text units of various scales, but we have linkages among text units, visual elements, and sound units […]. In hypermedia, there are more kinds of connection than those provided for in print genres" (Lemke 2002: 301).

Djonov states that "Understanding user orientation is an important challenge for hypermedia design, discourse analysis and literary education. The need to address this challenge increases with the steady expansion of today's most popular and complex hypermedia environment, the World Wide Web (WWW)" (Djonov 2008: 216). Certainly, in the case of websites for children, different criteria need to be considered to keep the focus of the communication clear and thus avoid distraction for children of different age-groups. The main issue is how the attention-grabbing elements are deployed as these attractive elements can also create some confusion for children, especially the younger ones.

Grades 3 and 4 - The Scrub Club
This website http://www.scrubclub.org/home.aspx was created by NSF International, an independent, not-for-profit non-governmental organisation, "dedicated to being the leading global provider of public health and safety-based risk management solutions while serving the interests of all stakeholders." The aim of this website is "to raise awareness about the benefits of handwashing and ultimately improve the health of children and reduce school sick days." Figure 1 shows the homepage.

From the answers to question 1 on the questionnaire, almost no participants were able to understand, from the homepage alone, that the website was about handwashing. Some participants deduced 'hygiene' or 'cleaning' because of the word 'scrub' and 'flu' and the

bubble sounds that are emitted when the mouse is moved over the page. The 2 children (in the same group) that did deduce 'handwashing' were both in the higher age-group and did so by reading the captions that appear when the mouse is held over one of the scrub club members. Even if the primary communicative aims of the website was not understood by the majority of children (92%) from the homepage, most children did understand the general orientation of the message and were interested in exploring the website: meeting the members of the 'Scrub Club'; watching the 'webisodes' or, most popular, 'playing the games'.

This website was partly chosen due to the low lexical content, but it would seem that even with little verbal decoding, the children in grades 3 and 4 were unable to correctly identify with clarity the subject matter of the website, *i.e.* the Field, in Halliday's terms (Halliday 1989). This was partly because the narrative within which the Field was placed overtook the importance of the Field itself. In the digital context, the narrative is the story within which the communicative aims are encapsulated (section 2 provides a deeper discussion of narrative in the digital environment). However, it seems that the primary communicative aims of this edutainment website (handwashing) became secondary to the narrative that they are encapsulated in (the Scrub Club), After spending time using the website, when probed about the Field of the website in the interviews, many children still thought the website was about 'the Scrub Club', when asked what they had learned, many did mention handwashing.

The relationship between the narrative and the Field is very delicate, as it incorporates the compromise between entertainment and education. Comparison with other media edutainment vehicles is useful here. Considering the long-running American education television series, Sesame Street, for example, the narrative employed here relies heavily on the Sesame Street characters to embed the educational content. The TV series vehicle allows this narrative to be developed over time and allows the communication of multiple educational topics in multiple contexts over a long period of time (as long as the series runs, years in the case of Sesame Street), all while the children are being entertained by the Sesame Street characters.

However, the genre of web-based edutainment has a much more limited time and scope in comparison to a TV series. It must communicate specific content and has less possibility to be reproduced to communicate other Fields. For this reason, the web-based genre does not have the opportunity to develop the narrative in the same way a TV based series does. In this website, the highly character-based narrative strategy seems to have similarities with the edutainment narrative tradition that comes from television but websites do not allow the development of such characterisation without creating a misdirection of attention for this age group, as the results suggest.

There was also an issue with the density and complexity of the verbal and non-verbal content. The reading path meant that to decipher the Field of the website, there would need to be complex linking between characters on the homepage, the puns within their names, the images of their transformed avatars, the sounds emitted from the cursor and the name 'Scrub Club'. Alternatively, the user would need to click and follow a number of hyperlink
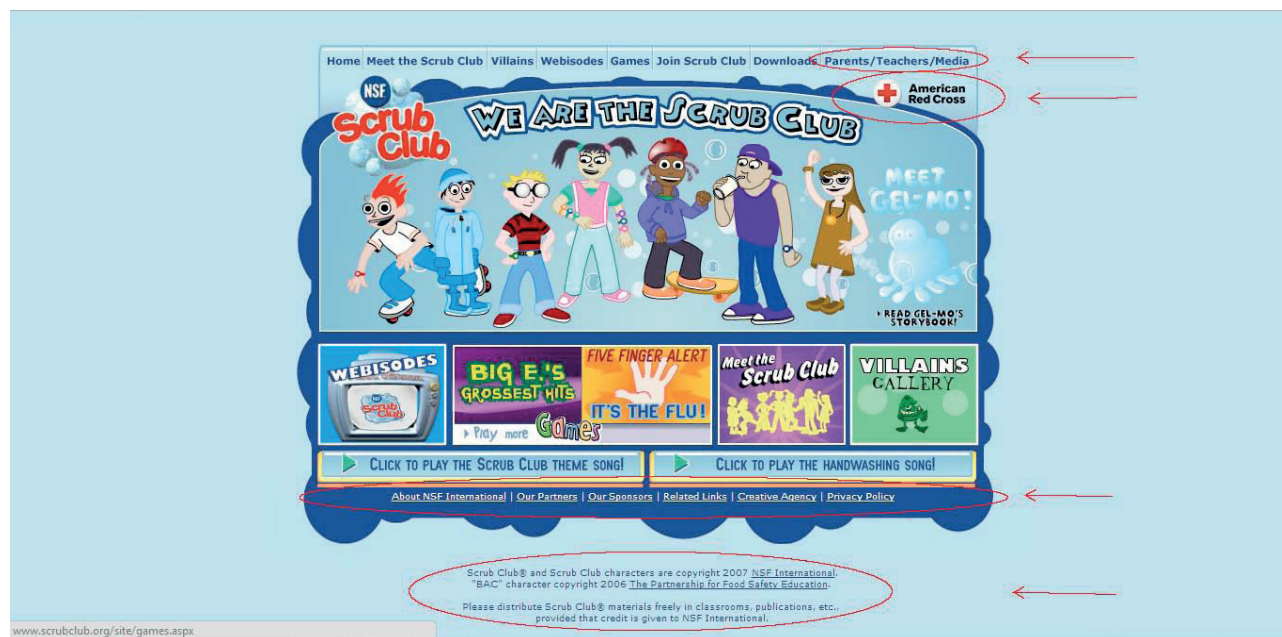
Fig. 2. Adult content on Scrub Club homepage.

pathways to get more information that was embedded in games, videos or interactive activities. This information was consistently secondary to the activity itself and was often lost as the activity was the focus of the children's attention.

If we consider the interaction between verbal and non-verbal elements to transmit Field we can see that, with speech bubble, semiotic conventions of the genre (children's visual narratives) were respected. However, the complexity of both the verbal-text and the multimodal communication was considered unsuitable to transmit Field to this age group (cf. Karatza 2017; forthcoming).

Although this is a website for children, there is also some content for adults (see Fig. 2). When asked about content that was intended for adults, only 21.43% of children observed that there were any elements. The majority believed there was no adult intended content whatsoever. The elements for adults are all static, non-dynamic elements that are placed outside the frame (cf. Vasta & Trevisan 2017), these are indicated by the red arrows in Fig. 2 which include links: for parent and teachers; to information on the NSF organisation that created the website: to information about partners; to information about sponsors and to information about privacy policy.

When asked about these overlooked elements in the semi-structured interview, children simply replied that they had not noticed them when answering the questionnaire. In fact, many did not notice the writing outside the frame at all. These children, 78.57%, managed to skip over the elements for adults completely, stating with conviction that there was no content for adults.

When asked what they learned from the website, most children did cite 'the importance of washing your hands' and 82% declared they would go back to the site. Although

out of these 82%, overwhelmingly 72% said they would return because the games were engaging or aroused their emotions and only 14% because it was about an important social issue or for more information on this topic. Very few children were able to retain any specific information relating to the information given on the website, information about bacteria, E. coli, salmonella, campylobacter, or shigella.

Grade 5 and 6 - BAM! Body and Mind
BAM! Body and Mind www.bam.gov is an online destination for children created by the Centers for Disease Control and Prevention (CDC), an agency of the U.S. Department of Health and Human Services. Designed for 9-13-year-old children, BAM! gives them information on healthy lifestyle choices. The site focuses on topics identified as being important by children: such as stress and physical fitness. It employs a child-friendly language, games, quizzes, and other interactive features.

BAM! Body and Mind is also directed to teachers, providing them with interactive and educational activities that are linked to national education standards for science and health set by the National Research Council, the American Association for the Advancement of Science, and the Joint Committee for National School Health Education Standards.

The results showed that 75.21% of the children correctly identified the Field of the website from the homepage. The answers to question 2 of the questionnaire showed that this was done from decoding the text through verbal content. They understood that the Field of the website was health and wellbeing because it was called 'BAM Body and Mind' with hyperlinks at the top of the page labelled 'diseases', 'food and nutrition', 'physical activity', 'your safety', 'your life', and 'your body'. However, there was still some confusion with 35% interpreting the Field incorrectly in grade 5 and 7% interpreting the Field incorrectly in grade 6. The reason for this misinterpretation was that there was too much information and too many distracting elements (dynamic images, sound that was coherent with peripheral message and not the central message, conflictual modulation of the page, inconsistent colour rhymes) that distracted from the central message. This 'semiotic noise' disturbed the correct identification of the Field for these few children.

In terms of viewer-mediated interaction and its functional potential, the various items on a page can be clustered into autonomous moving items which do not require viewer intervention. These are: (a) *self-activating items* (Baldry & Thibault 2006: 147); (b) *interactive items*, *i.e.* items that activate when triggered by the viewer using the mouse; and (c) *unresponsive, static, or inactive items*, *i.e.* items that have no viewer influence.

The dynamic elements often disturbed meaning extraction by being placed in the centre of the webpage or being dedicated a larger area of the screen. These dynamic elements often communicated the narrative of the Field and not the Field itself, hence leading to confusion. To explain this better, the central message of health and wellbeing was embedded in the narrative of a superhero themed section or a section dedicated to games. However, 'The Game Room' and the superhero modelled 'Immune Platoon' led some children to think the website was about games and superheroes and not about health and wellbeing. The narrative of superheroes and games overshadowed or dominated the Field (health and wellbeing) to such an extent that the Field was sometimes missed altogether. The questionnaire revealed that over 50% of both grade 5 and 6 students elicited meaning from integrated semiotic

Fig. 3. BAM Homepage 2015 www.bam.gov,

channels, but that grade 6 students had much better judgment in weighing those resources to come to the correct identification of the Field. Therefore, the metasemiotic awareness in the Grade 6 students was decidedly more developed (cf. Vasta & Trevisan 2017).

The use of colours has become synonymous with texts for children. Consider the use of colour in children's picture books, comics, illustrated books for children, school books that increasingly use non-verbal communication and colour. Colour is often used as a resource to attract attention and to maintain concentration. However, colour is an important semiotic resource and colour rhymes can be employed to show the coactional, cothematic or coaxial links. In the BAM homepage, however, there were no colour rhymes linking items, themes or activities. The colours did not add any more meaning other than simply being colourful for children. This led some children to describe the use of colour as being too intense and it emerged that it actually distracted rather than aided decoding of the verbal texts and page organisation.
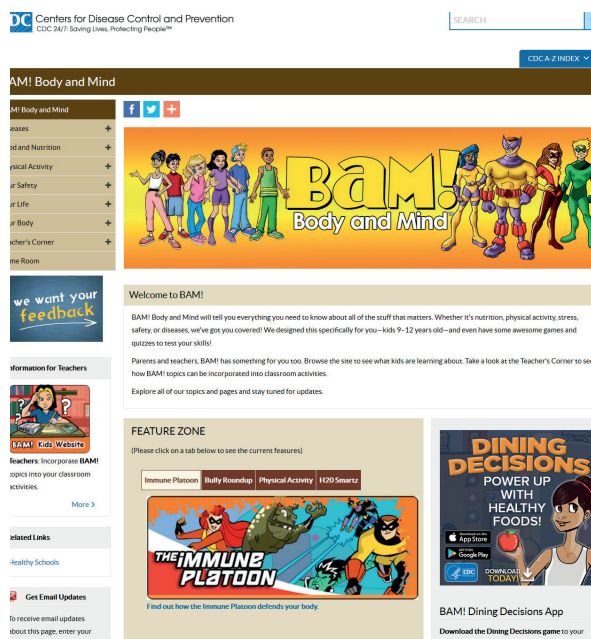
Fig. 4: BAM Homepage 2016.
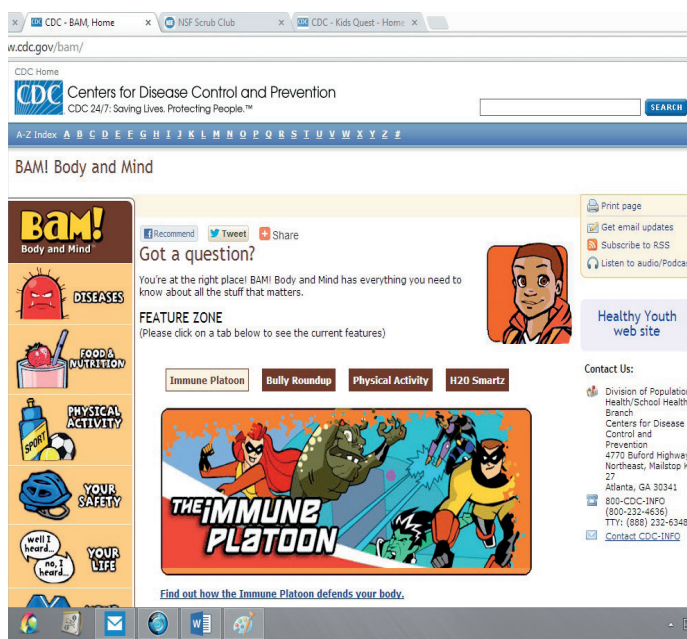
Fig. 5: BAM Homepage 2018.

A diachronic investigation showed that the website has evolved overtime, and the changes reflect the observations made above. Figure 4 and Figure 5 show the homepage in 2016 and 2018.

The website changes over this period show a better deployment of the elements that make up the homepage, which leads to greater coherence, more suitable reading paths for the children this age group. This was achieved through better salience balancing. For example, the dynamic elements like the 'Immune Platoon' feature which caused confusion is some children, has been de-emphasised (reduced in size and rendered non-dynamic) and has a less central position. This de-emphasis of the originally dynamic element leads to greater attention being given to the menu on the top-left hand side of the page and the BAM title. This creates a clearer reading path and anchors with links on the left-hand side of page. There is also less semiotic noise with the colour background being replaced with a white background. In addition, icons over the links are placed on left and reduced in size (Figure 4) and then the icons are removed altogether (Figure 5), thus emphasising decoding through the verbal text of the primary communicative aims. Better integrated framing strategies and a more logical modular deployment are adopted. Moreover, there is greater chromatic coherence in communicating importance of salience and not just an overuse of bright colours for children *e.g.* colour emphasis for content links on left. The web designers have made the homepage more coherent with the pragmatic/schematic super-structure that characterises this emerging mini-genre (Cambria *et al.* 2012).

Grades 7 and 8 - Kid's Quest
The Kids' Quest http://www.cdc.gov/ncbddd/kids/index.html is an online destination for children created by the Centers for Disease Control and Prevention (CDC), an agency
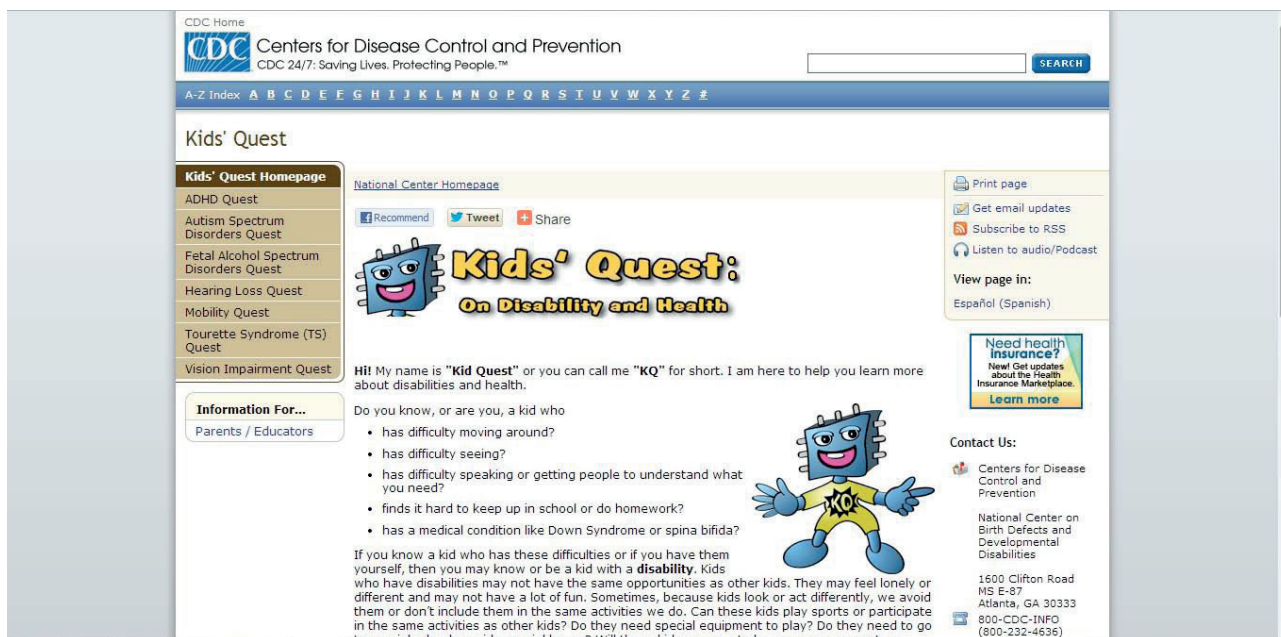
Fig. 6 Kid's Quest homepage http://www.cdc.gov/ncbddd/kids/index.html.

of the U.S. Department of Health and Human Services. Although students can do a 'quest' entirely on their own, parents and teachers are suggested they work with children to share ideas, talk about issues raised, and encourage students to reflect about themselves and others. This site is intended to get children to think about people with disabilities and some of the issues related to daily activities, health, and accessibility. Figure 6 shows the homepage.

This homepage has no dynamic elements. It was largely based on written text, which eliminated much of the confusion noted in the other homepages, but was not appreciated by the children due to its lack of 'entertainment' qualities and due to the fact that it did not satisfy their expectations of a website. As will be demonstrated later, by Grade 8 the metasemiotic awareness and genre sensitivity in some students was so elevated that they felt they could criticise the organisation of the homepage for its communication aim (cf. Bortoluzzi 2017). Table 1 shows the transcript of one such instance, a child, LB, who was 13 years old at the time of the interview.

In Example 1, the student LB shows to have already developed a sense of how the textual organisation of elements in a multimodal text should be realised. His answer to question 1 of the questionnaire, showed a complete and corresponding interpretation of the Field. By referring to the attractiveness of the website, s/he is discussing the Tenor, the interpersonal metafunction (Halliday & Matthiessen 2014). However, s/he makes a judgement about the author's choices regarding the textual (Mode) and interpersonal metafunctions (Tenor) and criticises the choices made, offering alternative solutions to achieve the communicative aims and create a suitable reading path in this context of situation and context of culture. LB has developed a clear idea of the patterns that a homepage for this genre should follow as opposed to other pages in the hierarchy of the website. S/he has developed a knowledge of

the context of culture through exposure to communities of practice. Their observations on both the textual and interpersonal metafunction would suggest that s/he has a clear idea of the register for this mini-genre. S/he shows highly developed metasemiotic awareness with great sensitivity to genre and has expectations in the homepage organisation. Moreover, s/he verbalises it and does not just perceive or expect it. What s/he was able to verbalise was also reiterated by the results of the research in reference to the other students who perhaps did not have the same media literacy, metasemiotic awareness or metalanguage to verbalise their analysis as this student.

Tab. 1. LB extract Example 1.

2 mins 38 secs 4 mins 05 secs	LB Like this part 'Getting started' shouldn't be on the bottom, it should be here on the side, or up here… and ere…because when a person sees the site sees immediately this and on the bottom can even be something quickly done like…but these two sections should have been slightly more up like this space is unutilised and this space too maybe even if they had made the text smaller it would have been nicer because where are all the images are here it would have made it more attractive and made nicer to see this starting part on the top or the side on a bar like here which are on many sites like the webquest were like this or they were just a plain site with a background with paragraphs and links or they were like this with sections on the sides. Like on a site for a book 'to kill a mocking bird' it was like there was a sidebar showing what you wanted with: share, chapter 1, chapter 2, and on the right side it was completely like this with description, if you need help,……

Table 2. LB extract Example 2.

6 mins 34 secs 7 mins 24 secs	LB The thing I saw was that it was not very …many kids like animations on sites, this one did not have any of them. It's ok, I know it is difficult to programme an animation from when you scroll on things but kids like a lot these things and they like more not square but more like circular, more bright, more chromatic. But being healthcare site I wouldn't overuse these topics about colour, roundness and animations, more just put these to keeping the viewer on the site thinking 'oh this is nice' and let him continue to read the rest though….

In Example 2 (see Table 2 LB) understands that there is a potential conflict of registers as an entertaining site for kids is potentially in conflict with an informative site about illness or healthcare. He measures the semantic resources to compensate for this potential conflict, again perhaps in a way that would have been more suitable for children than the website designers had done. It could also be argued that LB is referring to what Baldry and Thibault (2006: 152) define as 'dialogic engagement'. They interpret this in terms of how the potential of the structure of the genre unfolds. Three characteristics of interpersonal engagement are acknowledged: *Appeal*, functional changes in the object to increase the viewer's attention; *Orientation*, the forced positioning of the viewer towards an object, for example, indifferent to the object being an integral element of a scene or if it has potential for action; and *Action*,

the specific purposes achieved via performing specific action on the object (adapted from Baldry & Thibault 2006: 152).

Baldry and Thibault suggest that, in hypertext, reading positions can emerge from the "preferred way of integrating the activities of visual scanning with the potential meaning proposed by the page" (2006: 105). Considering meaning-making potential from dialogical relationships, items on a webpage can fulfil a new function. Dialogic potential can be produced through action or activity; it can also be produced through intertextual relationships. These relationships occur between items on the page. Clear distinction between the interpersonal, textual or compositional resources (used to attract the attention of the viewer) may not always be possible (Knox 2009; see also Kok 2004) *e.g.* the textual function in multimodal texts (compositional) could also be considered the scale balance needed between the visual and verbal elements for the spatial arrangement *i.e.* page-layout (Royce 1998: 43, 46). Kress & Van Leeuwen (2006: 193-194) sustain that within multimodal media, the top of the page is the most important sector and is usually where the most salient information is positioned. These results would suggest that, with digital natives, reading paths emerge through salience balancing, avoiding semiotic overload which potentially complicates the decoding of a text and the skilled deployment of anchors and framing measured to the metasemiotic awareness, media literacy on the part of the user skills of the audience.

Conclusions and Guidelines

The aims of this study were to investigate critical thinking and multiliteracy skills in children from 8-13 years old when dealing with multimodal texts regarding health and well-being in ICT-mediated edutainment websites. An integral part of literacy, in this context, is critical thinking and the need to understand the values of a CoP, community of practice. By nurturing this cultural knowledge in children, especially 8-10 year olds, also through genre awareness, ICT-mediated texts can actually facilitate interconnections, creative skills and interactivity in children. Much of this depends on the suitability and coherence in those texts to deploy the elements in such a way that creates a reading path in line with the child's meaning making strategies. That is to say to create the measured salience balancing in the websites so as to foster greater critical awareness, greater multiliteracy and multimodal skills in children, which are fundamental in the construction of their identity in a social group.

When creating edutainment websites and especially homepages, designers should weigh the complexity of the integrated semantic resources, otherwise meaning extraction becomes too complex and the communicative aims can be lost in the narrative (see section 4.1 The Scrub Club). When considering the balancing of verbal and non-verbal components on a webpage, designers should bear in mind that younger children tend to overlook the verbal text, only focussing on words which are made particularly salient (see section 4.2 BAM). Therefore, designers should ascribe greater salience and iconicity to the information conveyed verbally. This may be done by reducing semantic noise, de-emphasising the non-primary elements in the text, and thus increasing the salience and iconicity of the verbal text (see sections 4.1, 4.2 and 4.3). This is crucial to aid child understanding of the webpage.

Different modes have different potential effects on learning. What can be done with

image or writing or through interactive activities differs in ways that are significant for learning outcomes. Children often do not read all modes as being meaningful: they rely more on the visual mode at younger ages, *i.e.* (moving) image and colour, to make sense of the representations. They seem to 'trust' the empirical evidence of the visual mode.

Children love interactivity. Interactivity can be anything from fully-fledged games to smaller activities, such as polls, quizzes and community features. Children enjoy making their mark on websites, posting thoughts and artwork, creating riddles for others, and entering contests. Online gaming has been very successful in attracting young audiences, because it offers many different levels of interaction and participation simultaneously. However, there are a number of pitfalls to adding interactivity to websites. The main one is the interface design. Interactive activities are usually more complex than static content presentation and therefore include more features and controls which can obstruct the primary communicative aims through a lack of salience balancing, or through creating semantic noise that distracts the user. In the development web based edutainment websites genre, there has been influence and borrowing in narrative techniques that are more perhaps appropriate to other media, like television for example (see section 4.1). As this genre matures, there is increasingly less borrowing from other media types and more the suitable patterns and reading paths, as can be seen in the comments of the digital native child, LB, in section 4.3.

The functional objects on an internet webpage have been described as *anchors* (Djonov 2005), *clusters* (Baldry & Thibault 2006) and *items* (Kok 2004). For example, Kok conceptualises an *item* as the "instantiation of one semiotic resource, or a combination of instantiations of different ranks of different semiotic resources joining together as a methodologically justifiable whole" (2004: 134), which means that, in Kok's terms, an item could be represented both by a single object or a grouping of objects on the page. This definition of item, however, does not take into account that not all items function in the same way, or as Burbules points out, "imply the same type of semic relation" (1998: 104). Baldry and Thibault (2006), on the other hand, acknowledge that a "hypertext object has an ambivalent status: it is a visual image at the same time that it is more than that" (2006: 146). They refer to the elements that enter into meaningful relationships on a webpage as *clusters*, mainly on the basis of the clustered objects' potential for viewer-mediated interaction (2006: 121). Whether anchors, clusters or items, the perceived meaning and importance needs to be shared by web designers and web users. This can be leveraged by salience balancing (see sections 4.1 and 4.2).

Children, 'digital natives' (Bennet, Matton & Kervin 2008; Li & Ranieri 2010), have demonstrated both semiotic and critical awareness. This is true both regarding multimodal texts and the text/user interaction. Nevertheless, multimodal/multiliteracy strategy awareness in reference to the encoding and decoding of meaning happens in specific contexts and so does not have set or fixed patterns that can be meaningfully described or defined (Flewitt 2013; Gillen & Hall 2013). It would seem that children require collaborative help in developing and nurturing metasemiotic knowledge and a working knowledge of the instruments, processes and strategies required to for new media and ICT-mediated contexts. Pedagogical models that promote empowerment, user agency and autonomy must be developed and applied to this. This will help to bring about the "ownership" of discourses – in Fairclough's

terms (2001: 236) – which comes from being a member of a community of practice, learning the culturally influenced genre patterns, and critical thinking in reference to the information that is exchanged and the people involved in the interaction.

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Annexes

QUESTIONNAIRE FOR CHILDREN WEBSITE

NAME..SURNAME..
CLASS..

Look at the homepage for 3 minutes without clicking and then answer the questions on your own:

1. What is the website about?
....
....
....

2. How do you know what it is about?
....
....
....

3. Do you think the website is well organised? (Choose an answer):

| ❏ very good | ❏ good | ❏ Not very good | ❏ bad | ❏ I do not know |

4. What elements most attract your attention? Why?
....
....
....

5. In your opinion, are there aspects which are not for children? 6. If so, which?
....
....
....

7. Are there aspects which let you interact with the site? Which?
....
....
....

8. On the homepage, what would you click first and why?

....
....
....

Now explore the site for five minutes and click where you want, taking into account that we will be asking your opinions at the end.

9. Did you like this site? (Put a cross near one of the following possibilities):

❏ Excellent	❏ Good	❏ Fair	❏ Poor	❏ I do not know

Why?

....
....
....

10. Would you go back to the site?

❏ Yes	❏ No

Why?

....
....
....

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