Three challenges when designing for children’s everyday digital literacy

Abstract

We use the concept of digital literacy to refer to people’s competence of expressing themselves in computational form, and in this paper we specifically discuss the design of interactive technology aimed at letting children become digitally literate. A rarely discussed aspect of digital literacy in this respect concerns how it is supposed to take form in the context of improvised styles of use and interaction, resembling the kinds of activity commonly observed in kindergartens, school yards and centres for after-school activities. In such settings children often organize their own play activities, peers may go in and out of activities as they want, often without any necessary intervention by adult supervision. We align this kind of activity with the notion of ‘casual leisure’, and outline four basic challenges concerned with: a) a perspective on interaction, b) activity and context, c) the view of the user, and d) the character and role of the technology. We discuss these in relation to research attempting to design, evaluate, and make useful sense of children’s digital literacy in such activity.

Our analysis identifies the sources of these challenges as due to expressions of tension between play and learning, between designers and users and a general striving for ‘hard fun’. The challenges and their consequences may be summarised as 1) the use of setting as allowing for spontaneous interactions, 2) the striving towards a participants’ perspective, 3) the incorporation of offline and social aspects into the design, and 4) the balancing of challenge with the easy and the accessible.

Introduction

The notion of literacy has traditionally been used to describe people’s communicative competencies through written language and the ability to read and write as a necessity for participating and taking part in society. With the development of digital media the notion of digital literacy has been proposed to involve an equally important ability in co-
temporary society. As discussed at a workshop on digital literacy; Interaction Design and Pedagogical Practice in Stockholm 2007, the notion of digital literacy suggests a very broad spectrum of understandings and usages. Notions such as simulation literacy, gaming literacy, online forum literacy and even Facebook literacy were discussed during the workshop in attempts to denote the multitude of specific meanings involved. This is due to the plasticity of the digital material and its virtually endless ability to represent and enable a range of different kinds of activities. Exploring digital literacy can therefore not be seen as a “remediation” (Bolter et al. 1999) of competences and skills developed with other kinds of media expressions. Instead, a whole new range of aspects specific to the digital media such as interactivity, dynamics and mobility are put to the fore.

The importance of digital literacy naturally holds a number of consequences and challenges for the educational system, but just as importantly also for almost all other social settings, as the use of digital artefacts is becoming an integral part of everyday social life and communication. In line with this development it has been argued that digital literacy will become increasingly important for future generations as computation becomes more and more embedded and ubiquitously integrated in our everyday environments (see e.g. diSessa 2000; Kelleher et al. 2007).

We use the notion of digital literacy to denote the ability to understand, and to make oneself understood through computational materials, for instance to create an animated game or to understand an interactive story created by a friend, or simply to engage in creative and playful text-messaging dialogues. Such media-specific aspects of usage and communication with digital media create new conditions and possibilities for researchers and practitioners with the ambition to understand and contribute to people’s possibilities of expressing themselves with digital technologies. It should be noted that digital literacy in this sense should not to be mixed up with “computer literacy”, which concerns the ability to use a personal computer. Rather, the notion that we propose involves a more fundamental engagement and understanding of the qualities and possibilities of computational materials.

One key characteristic of digital media is that they require mediation through digital devices upon which someone is expected to actively engage in order for the media to take form. Compared to traditional media forms, designers of such mediating devices thereby play a very important role in supporting digital literacy; by providing the hardware and software tools upon which such competences must be based. The purpose of this paper is to promote discussion of how constructivist and situated perspectives on action and learning could be given the place as foundational theory in such practical design work, aiming specifically at children’s possibilities of expressing themselves in digital form in everyday casual use situations.

Based on discussions of currents trends in Human Computer Interaction (HCI), Interaction Design and Children (IDC), as well as in Computer Supported Collaborative Learning (CSCL), we outline four challenges that we believe need to be further addressed in
research, given the goal of designing interactive technologies that effectively may be appropriated by children to blend into their everyday practices, and thereby making them powerful vehicles for their own personal expressions. Especially, we bring in the notion of casual activity to emphasise how technology also needs to be designed for settings that are not primarily for work or learning. Bringing these challenges into discussion is primarily intended to promote conceptual awareness of how designers make use of notions of play and learning, and casual and serious activity, in the design of new technology.

Designing for digital literacy in casual settings

A common claim in research on technology targeted at children is that it should be grounded in children’s everyday play practices, and how these are physically as well as socially manifested and organised (see e.g. Druin 1999). This is the case both for technology designed for specific educational settings as well as for more informal and open-ended activities. Based on such ambitions we draw on Robert Stebbins’ (Stebbins 1997) work on leisure, emphasizing the difference between what he defines as serious, rule-based and well-structured games and activities, versus the broad range of more casual leisure activities. According to Stebbins’ definition:

“…casual leisure can be defined as immediately, intrinsically rewarding, relatively short-lived pleasurable activity requiring little or no special training to enjoy it. In broad, colloquial terms, it could serve as the scientific term for the practice of doing what comes naturally.” (Stebbins 1997 p. 18)

In everyday interaction with and around technology, the casual dimension is one of the most significant. This is exemplified by patterns of watching television, listening to music, or the social use of mobile and online technologies. However, in relation to its prominent role in everyday settings, the methods used for designing and evaluating technologies aimed explicitly at such modes of usage are fairly sparse (see however e.g. Sengers et al. 2006). The casual dimension is of course extensively explored in the commercial world, but the relative negligence of this in technology-oriented research indicates that an increased research focus on the casual dimensions could contribute to a range of important understandings. Moreover, notions such as play and learning, as well as casual and serious technology use, involve conceptual dichotomies that may be difficult to combine and which therefore provide intriguing design challenges for the case of digital literacy.

When looking at the area of Interaction Design and Children, the research is almost exclusively aiming at the more ‘serious’ modes of playing within formal or semi-formal educational settings such as schools, museums and organised after-school clubs. Breaking away from such conventions may be a challenge in design, but also in the way we set up studies and analyse systems in use and estimating their social and educational value. Moreover, satisfying a research goal articulated in terms of ‘learning outcomes’ or ‘pro-
ductive conversations’ sometimes obstructs the study of activities that allow for self-driven, spontaneous activity.

Design Challenges

The challenges that we propose are grounded in two key trends in current HCI research. Firstly, we draw on phenomenological and ethnomethodological approaches, which have a fundamental aim of overcoming dualist conceptions of knowledge and action. This relates to the recent focus within HCI as well as in CSCL to increasingly turn attention to the study of practices in natural and casual use settings. Since Lucy Suchman’s (1987) critical analysis of some of the basic assumptions on how the concept of interaction has been applied in HCI and artificial intelligence (AI), a practice-oriented perspective has become increasingly called for, more recently illustrated through e.g. Dourish’s (2001) work on embodied interaction and Jacucci’s work on the concept of performance (Jacucci 2004).

Secondly, our work follows the trend of conceptualizing HCI as a design-oriented field of study, (Löwgren et al. 2004; Bødker 2006; Vetting Wolf et al. 2006), drawing on e.g. Donald Schön’s (1983) account of reflective practice as an essential aspect of professional work. This includes the reaction against goal-oriented problem-solving methods, emphasising instead ludic and experiential dimensions (McCarthy et al. 2004).

We have compiled our understanding of the consequences of these trends into four basic challenges for research attempting to design, evaluate and make useful sense of technology that aims to support what we find to be at the core of digital literacy for children, i.e. their possibilities of expressing themselves personally and socially. These challenges are discussed with reference to research in Interaction Design and Children and its overall tendency to degrade casual aspects of interaction in favour of institutionalised and formal use of technology. The four challenges that we present are organised around the fundamental attitude that all design work inevitably reflects, in reference to: a) perspective on interaction, b) activity and context, c) the view of the user, and d) the character and role of the technology.

Interaction: Acknowledging All Interaction

A general development in contemporary social, cognitive and educational sciences is the so called ‘practice turn’ in which embodied and social aspects of human activity are put to the fore (Schatzki et al. 2001). Similar strands of development can be found in notions of situated learning and cognitive apprenticeship (Lave et al. 1991) as well as in theoretical perspectives explored in design work where the inevitable intertwining of play and learning is taken as a starting point (Papert 1980; Jonassen et al. 2000; Paiva et al. 2002; Zuckerman et al. 2005). Fundamental to these perspectives is a shift in focus from considering “processes of individual cognition” as basic, to considering processes of “interac-
tions people have with each other and with the material and representational resources in their environment” as basic (Greeno 1997, p15).

A core consequence of this perspective on interaction, which has been highlighted for instance in Dourish’s work on embodied interaction (Dourish 2001), concerns how some of the most important aspects of a shared activity lie outside of the actual interaction with a computational system. The expanded space for using technology provided by the physical and social context includes many important issues that are central to everyday casual interactions, such as ownership, attachment and personalisation. Especially in children’s play, an important aspect concerns the ability for participants to socially configure the ‘rules’ of the activity in which the technology is taken into use, and also to physically arrange their interactive resources. This suggests that we need to consider both interaction with the system and interaction between participants around a system in our design efforts.

In HCI, the practice-oriented perspectives have still been most influential in empirical analyses of interaction with new technology. The impact of these theories for designers still leaves issues open for exploration. An example of this is the present concern of designing for collaboration, sharing and social interaction, which is generally viewed as a new and difficult step to take from previously individually-oriented design perspectives. The dominance of the individual perspectives is illustrated for instance by the sole existence of research fields such as CSCW and CSCL that specifically address collaborative and social dimensions of design and use, rather than viewing these as central to HCI in general (see also Rogers’ (Rogers 2004) review of the role of theory in interaction design practice).

This view of social and shareable use as a new and more difficult design problem (than individual use) is fundamentally based on it being positioned within the theoretical legacy of individually designed user interfaces. This suggests a need to reformulate the design space so that social and collaborative aspects are not viewed as extraordinary design problems, but rather as the basic ones. To pursue such a commitment naturally involves a number of challenges, theoretical as well as practical. However, as discussed e.g. by (Fernaeus et al. 2006), this could be viewed as primarily a conceptual task – shifting from an information-processing perspective to a more action-centric one (Heath et al. 2000; Dourish 2001).

**Activity and Context: Avoiding pre-imposed structure**

Ethnographic and ethnomethodological studies in schoolyards and kindergarten settings have identified a number of aspects that characterize children’s ‘natural’ play activities. Typical examples include a large amount of spontaneous, situated action, social improvisations and a constant flow of setting up and reconfiguring the rules for participating in and contributing to the activity (e.g. Goodwin 2000). Moreover, children often move in and out of, and between different activities, and play tools are commonly transferred physically as well as imaginatively between different play contexts (Smith 1994; Wyeth 2006).
Combining findings from such studies with the ambition to validate the outcomes through some well-established measure may be difficult, especially in educational settings. On the other hand, children's everyday play and general social interaction requires no specific structure, and yet it is claimed to be one of the most important contexts for learning and development (Vygotsky 1976; Smith 1994). We see no reason to suspect that computer-mediated casual play would not have similar properties. This implies that an equally valid measure for successful educational technology could be that the children engage in an activity that resembles a conventional social play practice.

However, when looking at the field of research addressing children's digital literacy, almost all publications and research projects display an active commitment towards what elsewhere has been called ‘corrective technologies’, i.e. technologies with the purpose of supporting interactions in a manner that make them more productive, more learnable, or more efficient within specific domains. Although this is of course often worthwhile, especially in educational contexts, ‘corrective technology’ may not always be what users will actually be willing to use.

This challenge thereby concerns how children's everyday play and learning is not always supported by a formal institutional system of education and guidance. It may therefore not fit naturally into the well-organized and structured means that research in interaction design commonly assumes, which is usually framed as targeting an existing ‘problem’ that needs adjustment. When the goal is to support deliberate, spontaneous and user driven interaction, we need to instead put increased effort into considering how the designs may be able to leave the usage of a particular technology open for improvised and creative play. This is not meant as a proposal to stop developing technologies explicitly for formal learning settings, but rather a way of cherishing casualness as a central dimension of human activity that we must find ways to more productively incorporate in HCI research.

The User: Accepting the participants’ perspective

A third challenge that is brought to the fore by looking at digital literacy in casual settings is what we call a “participants’ perspective” on action and interaction with technology. The participant's perspective emphasises that designers and analysts should attempt to understand how an activity in which technology is used is viewed by the participants – not to search for evidence that may serve to label the activity based on pre-imposed categories of what is wished for or expected. From such a viewpoint it is basically irrelevant whether the researcher categorizes an activity as play, learning, entertainment or something else. Instead it is argued that analyses should attempt to document how the participants go about doing and organizing the activity, e.g. what aspects of the technology they are oriented towards, what they make central and peripheral, and how they make the activity meaningful for themselves and their peers (Heath and Luff 2000).
A common argument in the design of tangible toys is for instance that a physical manifestation allows users to make use of experiences from interaction with other everyday objects, allowing the resources to blend into existing activities in a natural way. An interactive tabletop may be usable as an ordinary table, a classic PC keyboard may be used by several children at the same time, and games, software and mobile technologies are constantly observed to be appropriated by children in a range of unintended ways. This aspect of interactive technology draws attention to the quality of also being possible to use for other "non-intended" kinds of interactions.

This challenge might primarily be thought of as concerned with evaluation issues. However, seeking a participants’ perspective is of equal importance for designers in order to avoid being directed too strongly towards fulfilling goals that are not inline with their users. This again relates to the fundamental opposition in research on children's technology on how to relate to design goals in terms of learning, versus more general goals for children's creative, joyful and improvised activity. Balancing between these two sets of goals can be challenging, and within research areas such as CSCL and IDC, the former often stands in the way of the latter.

From a design-oriented perspective, Sengers and Gaver (2006) have conceptualized this challenge as "staying open to interpretation", thereby suggesting that designers should not have only one preferred interpretation in mind for how a system should be taken into use. Instead users should be allowed to engage in multiple possible interpretations of a technology. Such openness puts designers in a new position in the design process in terms of how to set up goals for their work and also how they orient themselves towards these goals. The same goes for evaluation. What should be evaluated and what is a successful design becomes less clear cut when there is no appropriate user interpretation to search for.

Aspects related to what children think of new systems, and how they would evaluate them are matters that are commonly discussed and addressed in research on interaction design and children. However, apart from participatory design projects, e.g., Druin et al. (2002), Ramachandran et al. (2007), Moraveji et al. (2007), user studies are usually designed as classic evaluations, aiming to assess the technology as useful for the children based on measures such as efficiency, learning outcomes and even the speed of mouse clicking (Pawar et al. 2007). The meaning that children make, their narrative, social and emotional engagement, and how they chose to appropriate the technology into their everyday activities, is generally less discussed (see however (Wyeth 2007) and (Hutchinson et al. 2006)).

This in no way means that the studies, or the systems presented, are not important for the children using them. Neither does it suggest that the literacy developed in the use of these systems will not go beyond the settings that are studied. Rather it suggests that the genre forces researchers to take on a perspective that brings up pre-specified qualities, rather than showing openness to the meaning that users may make of the system. A greater sensitivity to
what users interpreted the systems to be good for would probably have put forward other values, leading to an increased understanding of their view of the use qualities.

**Character of the Technology: Let easy do it**

Of particular relevance to the domain of children's technology is the relationship between the classic values of HCI (such as ease of use) and more recent developments in areas studying experiential aspects such as game play and flow, where virtually contradicting values are emphasized (such as challenge and competition).

This particular aspect has been discussed widely, and a common argument has been that technologies for children must not be trivial, since they would then take away the 'fun' of playing (Papert 1998). In line with the classic 'pianos not stereos' (Resnick et al. 1996) argument, research into children's technology often acknowledges the complex before the simple, the difficult before the easy and the serious before the casual. What has rarely been discussed is how casual play may also be an enjoyable, and in fact more common, activity in children's being with technology. If we look at many of the everyday artefacts that we have around us, collaborative, social and casual use is seldom a problem or something that occurs only occasionally. Quite the contrary, such usages are often the natural mode of being with artefacts. This includes how activities tend to develop on the spot, by the participants themselves, without assumptions of a priori commitments of what exactly should be completed or performed. The observation that casual activity does not result in the same kinds of engagement does not necessarily mean that it is less important, especially since the same activity may shift between casual and serious at different stages and by different participants.

We suggest an approach that appreciates stereos and pianos, in particular since children's use of technology more often has the character of a combination of serious and casual activity, apparent for instance in the extensive use of technologies such as television, music players, video games, instant messaging and online communities. Despite many strong arguments for more complex technologies (e.g. logo programming), this suggests that it is the easy that is in fact mostly taken into use. Hence, even though challenge can be a strong motivating factor, designers should consider the actions one chooses to make easy and accessible.

Moreover, when looking at systems developed specifically for children, the technology is almost exclusively argued as aiming for formal or semi-formal educational settings such as schools, museums and organised after-school clubs. This could be interpreted as 'child-engineering' as initially defined (Papert 1980) have lost some of its status in research as being less about designing for children and what they will deliberately and actually use, to instead aiming at what teachers and parents may expect or want in their practices. This is even though common knowledge, as well as empirical studies (see e.g. Jarkievich et al. 2008), show that children in unsupervised play settings are often well
equipped to bring new technology into their activities, and that they in these settings freely select which of the available toys, technologies, and online resources to use. This double-faced situation suggests that increased efforts into how to design, evaluate and look upon technology aiming for more casual settings may result in educational technology would that stand a better chance of being effectively incorporated into existing and future practices of digital literacy.

Conclusion
Given that expressions in digital form are important not only in formal education, we need to develop design approaches to also support digital literacy in other settings and contexts. When designing such technology for children, and for these technologies to be integrated in everyday play and learning practices, we argue that an increased effort should be put into supporting personal expressions and everyday social interactions.

A fundamental aspect of most human activity is the ability to communicate and express one’s ideas and knowledge to others. While people extensively express themselves and communicate through language, other forms of expression are just as important, such as making pictures, performing physically or using music. Different media are also appropriate for expressing different things, just as oral and written language are appropriate for different kinds of expression. It may for instance be easier to illustrate dynamic processes through a medium that is not static, while static media formats may provide a better overview. It is often argued that skills in utilising the properties of different forms of media expressions and their semiotic possibilities become especially important as a growing part of the media content around us are made with digital tools, and the ability to produce own such media, such as mobile content, interactive applications, and games, are becoming new important aspects of everyday learning and communication. New ways for people to express themselves through digital media are constantly being developed, and in accordance with this, expanded understandings regarding the type of situations where people may find such tools, resources and practices useful are necessary.

We have presented four theoretically grounded challenges involved in incorporating a practice-oriented perspective into the current discourse of interactive systems targeted at children in relation to the notion of digital literacy.

Just as literacy in the traditional sense involves a wide range of things that people can do through the use of written language, from defining the formal rules of a football game to playing with words in a child’s book, our understanding and appreciation of digital literacy should incorporate a similar richness in what can be achieved through digital technology.

Designing interactive technology for children that addresses these different dimensions of digital literacy is then not only a matter of supporting playful learning in the form of
structure, challenge and bodily forms of interaction. Equally important is to include the possibility to participate socially, from multiple perspectives, at different levels of engagement, and without requirements for a specific course of action. Note that our focus on the casual dimension is not intended as a call for abandoning the design of more structured forms of interaction. Rather this work is intended to promote design thinking oriented towards technologies that may leverage children’s possibilities for expressing themselves through digital technologies. Much current research on children’s technology is implicitly based on such assumptions, especially through the increased focus on systems that aim at supporting collaborative and more physical forms of interaction (Crook 1997; Price et al. 2004). However, we argue that a more foundational approach to these challenges needs to be further developed.

References


Ramachandran, A. D., M. Kam, et al. (2007). Social dynamics of early stage co-design in developing regions CHI’07, San Jose, California, USA ACM Press.


*Dispelling design as the ‘black art’ of CHI*. CHI2006, Montreal, Canada,
ACM Press.
Wyeth, P. (2007). *Ethnography in the kindergarten: examining children’s play experiences* CHI’07, Montreal, Quebec,
Canada, ACM Press.
*Play – its role in development and evolution*. J. Bruner, A. Jolly and K. Sylvia.
*Extending tangible interfaces for education: digital montessori-inspired manipulatives*. SIGCHI conference on
Human factors in computing systems, Portland, Oregon, USA, ACM Press.