# "Magic of Today: Tomorrow's Technology"
## *Wearables for Kids*

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**ABSTRACT**

Research is presented that illustrates frameworks being developed that involve young children in the process of development of future wearable technologies – A hypercamera - the KidsCam. It is envisioned that such digital technology will become embedded in educational culture forming part of the 'educational information ecology' [EIE] and create opportunities for shared reflection on early life experiences. A model of 'Situated Interaction Design' [SID] is introduced that is inspired from the domains of educational theory and practice, human computer interaction, cognitive science and interactive performance art.

**Keywords**
Situated interaction design, children, wearables, educational theory, educational information ecology, interactive performance art, hypercamera.

**INTRODUCTION**

Children's willingness to dialogue and play provides a rich opportunity to explore their visions of the future. Research frameworks are being developed that involve young children,
(4-10 years old) in the process of developing future technologies[1].

A model of situated interaction design [SID] is introduced in this paper and has been inspired by and draws upon theories from the domains of educational theory and practice, human computer interaction, cognitive science and interactive performance [1, 2,6, 8,11,13,15,16,17]. The methodologies illustrated also draw upon the authors' previous work [13].

A Situated Interaction Design model is created in response to the technological brief and the 'information ecology'. Aspects of the ecology that the model could encompass include needs, desires and expectations within which the technology and potential users are to be located. A brief description of a case study for SID is present for the Today's Stories project[2]. The case study describes the social-cultural context for technology development, theoretical paradigms and frameworks and introduces the interaction methodologies with reference to both 'design and educational ecology' and 'design and technology integration'.

**SITUATED INTERACTION DESIGN**

***Local habitations, Interactants and New Technology***

The local habitations[i] and interactants[ii] with which we are working are children, their teachers and parents from schools in Israel and Denmark. These 'Open School Communities' are reference groups that represent cultural 'educational ecologies'. They

[1] European funded Future and Emerging Technologies, Experimental School Environments www.i3net.org/ese

[2] ESE Today's Stories Project www.stories.starlabs.org

joined the research effort having a pre-commitment to the development of technologies that could support children's reflective thinking and action in future learning environments. They are coming together with researchers, educationalists, psychologists, designers and technologists to develop a wearable technology – A hypercamera - the KidsCam. The interactants, the local habitation, the social dynamics and the technology constitute part of what is termed an 'educational information ecology' [EIE].

***Paradigms***

A key paradigm that underlies the educational and technology development of this project is that of *reflection* both in terms of the 'reflective practitioner' [16] and Autonomy Oriented Education [AOE]. In Israel [AOE], is the educational philosophy supporting the researcher and school community interaction. It focuses on the development of autonomy, morality and belonging in children [1].

***Technology brief and vision***

The technological brief of the KidsCam was to create a wearable technology that would allow children to learn from reflecting on their actions and learn from other children's perspectives on their own actions. In time, similar wearable technology could become embedded within these 'educational information ecologies' [EIE] with the aim to support childrens' reflection in their early-life 'experiments in living'.

The KidCam will facilitate capture and document such "reflective experiments in living". Children will build digital portfolios of their day's interesting events. A key pedagogic aim being to support the development of social, communicative and emotional skills of children in the context of their everyday activities.

It is envisioned such technology will have a facilitating role, in that it will complement the discovery of alternative forms of educational interaction and the development of new media. Such phenomena often follow in the wake of the introduction of new technologies and facilitate systems change.

A particularly novel aspect of this technology is that it will support multi-user, multi-perspective [MUMP] interaction via digital artefacts captured by the hyper-camera. A community memory of a group of children will be co-created and evolve through a didactic process of dialogue and reflection. [14]. Such interactive digital artefacts could enhance and also contribute to cross-cultural understanding and critical technology awareness.

The existing local practice, infrastructures and technology use are being documented and conditions for acceptance and success of deploying this new technology in a social, cultural and ethical context are being investigated against the backdrop of the current socio-technic debates [4,5,7].

***Cross- Cultural Reference Group Profiles***

Staff and children in two countries Denmark and Israel have been contacted and sensitised to the project. There is continuous and ongoing activity to create technology awareness, skill development and pedagogic framing for both staff and children in relation to the Today's Stories project aims.

Four reference groups have been established. Two reference groups are located in the island of Funen, Denmark. The first is an integrated pre-school through eighth grade school with 140 pupils. The school is located about half an hour from the major city of Odense. The second is a 'KidSearcher ™ group established and located at the Natural Interactive Systems Laboratory, on the University of Southern Denmark campus at the Funen International Science Park. In Israel, two reference groups have been established in the suburbs of Tel Aviv. The first is a community school where two integrated pre-school/first grade groups of about thirty children each participate. The second is an elementary school, three first grade classes are involved, each with about twenty-five pupils.

In the case of Israel, the first phase of the Today's Stories' project focus and the majority of contact time has involved working with teachers. By comparison at the Danish site, the majority of contact time has been devoted to working in the classroom with children and staff.

## INTERACTION METHODOLOGIES

Interaction methodologies have been designed within this theoretical framework of an 'educational information ecology'. A model of situated interactive design [SID] has been developed and applied to the concept of 'Open school Communities'.

What follows is a brief outline of activities that have taken place at both sites. In Israel the program is currently being applied in an experimental framework in two schools in the Tel Aviv district of Israel, and in four kindergartens. The research team has worked to put in place an "experimental pluralistic" framework [1] for the development of the Today's Stories project. The team works in various settings. Work has focused on the preparation of staff to support the in-class reflective process of children who will be using the proposed technology. This has involved seven teachers, four nursery teachers and one staff member for thirty children [18].

In Denmark the project has been introduced to the whole school staff team. Contact was made with the first four early-years classes of the school 5-10 year-olds (60 children taught by 9 staff). The curriculum is designed so that the children have the opportunity to work in cross year groups approximately 25% of the time [18]. The initial phase of the project has focus on working with children aged 7-10 years old.

## INTEGRATING INTERACTION DESIGN AND THE EDUCATIONAL ECOLOGY

Interaction sessions are supported by classroom staff and have focused on developing children's technology awareness. Four key methodologies have been designed based on the authors previous interaction design research and practice. These methodologies have taken the following embodiment and are described as:

1) ***Experimental probe (EP)***
2) ***Community of Enquiry (CoE)***
3) ***Studio Theatre (VT)***
4) ***Smart Things***

Through the concept of the *'Experimental probe'*, we have introduced access to existing baseline technology for capturing digital and analogue material in terms of analogue and digital cameras. During the first phase of the project at the Danish school site, a suite of 'experimental probes' has been launched. This suite comprised of: analogue stills camera, disposable cameras, two digital stills cameras and a digital video camera with associated software including, iMac video editing software.

***'Community of Enquiry'*** is an educational concept and practice developed from the work of Mathew Lipman and his work in teaching philosophy to children [8]. This work has been adapted to create and support the evolution of children's 'critical thinking' skills and dialogue in the context of existing and future technology use from their personal and group perspectives.

***'Studio Theatre'*** has been developed using principles from drama, black theatre and filmmaking. The techniques have been adapted to create on site 'studio' sessions. These have been designed to facilitate children's skills in story-telling, storyboarding, transformation of narrative, prop making, role-play and independent use of video and photographic technology.

***'Smart Things'*** are prototyping and scenario building interaction sessions. Design tasks are set that encourage children to:

a) Imagine the present with the 'new'

b) Imagine the future.

Children make situated imaginary and realistic drawings. They build mock-ups and prototypes of smart things and clothes. They work both in-groups and individually to embody design ideas and are given contexts to 'role play', discuss uses and issues for future 'smart artifacts'. A short video film[iii] has been produced to illustrate the process of SID activity with the two Danish reference groups. The children working in their local environments filmed the majority of video material. Short video clips show

how situated interactive sessions that draw upon pedagogic and user–centered design methodologies were used to:

a) Sensitise the groups
b) Support skills development in base-line technologies
c) Encourage design activity related to the technology development
d) Support technology awareness.

The video is being used to provide a reference and reflection point for staff, children, parents and researchers. In addition it is used to disseminate the interaction methodologies to the research community.

## INTEGRATING INTERACTION DESIGN WITH TECHNOLOGY DEVELOPMENT

Outcomes from the interactive classroom sessions and discussions with staff and children have been incorporated into the initial phase of technology development e.g. concept prototypes, hardware specification, software requirements, deployment scenarios. Children have been responsive to requests from the interface design team of the consortium to contribute ideas for the interface 'look and feel'. These ideas have contributed to the concept and prototype development of both the wearable KidsCam and 'Composer Environment [18]. Within the discussions of social responsibility and integration of technology cross-culturally there are ongoing dialogue and incorporation of ethical consideration of technological development, privacy and community [4,5,9,12].

## EVALUATION AND TRIALS

Members of staff and students contribute to the ongoing evaluation of existing educational software for story making and editing. Members of the research team and teaching staff are currently exploring how this proposed new technology could support the curriculum.

'Reflection sessions' are planned where children will feedback their experience from using the 'experimental probes' and the KidsCam prototype system. A more in depth interaction analysis [6] is currently underway on samples of video data from the Today's Stories situated interaction design sessions. Scenario based interaction methodologies drawing upon practise from the human computer interaction [3,8] and performance arts arenas [2] are also being developed to support the design of the technology trials of the KidsCam.


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[i] Local Habitation –term used in biological science and ecological studies to refer to the immediate environment. More recently adopted in computing terminology, {see Nardi. B., O'Day V.L. Information Ecologies - Using Technology with Heart, 1999. MIT Press}.

[ii] Interactants – term typically used in theatre/drama context to describe 'action' participants. Extend beyond the traditional term 'actor' to encompass a variety of interactive performances. {See also term 'interactors' Boal. A. Theatre of the Oppressed, Pluto Press, 1979}.

[iii] How Did They Do That? – Wearable Technology, Producers: Panayi & Roy, Media Studio Workshop, Southern Danish University, Denmark, 1999.