an "intelligent" toy to engender meta-level learning in 4 - 8 year olds

Objective

- Within the overarching objective of testing children's learning using new devices, the éTui, the following sub-objectives are presented.

Additional objectives

- to develop a collaboration (partnership) with children and parents within their own home and with teachers in their classrooms to ensure effective design of the Étui;

- help parents and children appreciate the value and role of play in early learning;

- Research into technology documents differential rates of use between males and females and this can be observed even in the early years (Chen,1986: Igbaria & Chakrabarti, 1990; Francis, 1994). Awareness of this issue, as well as differential rates of development in the early years and cross-cultural implications will be addressed during the design and development of the éTui.

Early Learning

- Using constructivist learning models (Vygotsky, 1962, Bruner, 1986), the Étui, will enable children to:

- problem solve through their independent use of technology reinforcing the "learning through doing" philosophy.

- extend their creativity through exploration;

- observe artificial 'learning';

- reflect on their own, human learning;

- progress their learning through developing increasingly complex programming strategies;

- observe the transfer of learning between éTuis, thereby extending their understanding of "learning" and programming ;

- extend their learning styles through exploration of different styles of "programming".

éTui design

- to permit 'programming' by direct, physical manipulation eg clapping;

- to allow children to choose the programming medium which is most appropriate to their preferred learning styles;

- to extend beyond gender and cultural bias;

- to illustrate the process of stimulus/response learning;

- to allow real-time synchronisation of behaviour between two éTuis

- to allow "behaviour learning" to be communicated, so that éTuis can pass on their "learning";

- to investigate and develop stimulating and delightful child friendly and programmable interfaces;

- to be portable and adaptable.

New tools

The éTui is

- easily portable,

- programmable,

- friendly,

- multisensory,

- tactile

- communicative.

The éTui is designed to stimulate understanding about learning by comparison with the artificial "learning" of the éTui itself.

We intend to minimise the start-up skills needed to engage with the toy - for example through direct, physical manipulation and 'overt', consistent behavioural responses, but also to offer progression into abstraction and higher levels of complexity.

Although our tool will work as a stand-alone, collaborative activity, and inter-connectivity will add value to the learning experience.

The nature of the éTui is that it can be programmed using transcultural methods, for example, touch, sound (whistling), optical symbols/visual actions etc. The representation of this back to the user is of a form that is equally language independent - physical movement, sound, flashing light and perhaps user-defined symbols.

The toy's behaviours, and the training process involved in creating these behaviours are 'mapped' into a symbolic, text independent language, that can be used to extend the learning environment to tasks involving a virtual environment.

We are mindful that learning paradigms of interest may emerge from an single, or combination of existing learning concepts, where combined with the development of new technologies and artifacts to support them; technology thus acting to liberate greater learning potential from traditional paradigms.

Method

Formative evaluation strategies will be employed with the online community of parents and teachers and project partners.

Video communication will be used where appropriate eg by parents to illustrate specific learning episodes.

The design process will allow iterative testing of specific features in response to feedback from the reference sites.

The physical sub assemblies will then be created and tested at the field research sites.

Dissemination will occur throughout the project. This process is enlarged on below.

Formative evaluation

Formative evaluation methodology (Flagg, 1992) will be employed for project development, in line with current best practice. Industry is finding that the feedback from children, their parents and teachers should directly inform product design. For the Étui to be truly ëdelightfulí and engage young children, they and their families must be involved at every stage of the design process, and therefore the iterative design process will be utilised.

The project will not have neglected the social context within which the Étui will be used; ownership, control, institutional and social structures will both impact on the Étui's effectiveness and be themselves changed by it. We shall reflect on the significance of this in the light of our research.

Online reference community

Close collaborative links will be established with the families of 4 to 8 year old children attending a number of European schools. Using appropriate ICT technologies (including video and sound), asynchronous and synchronous communication will be stimulated and maintained between all participants using the model of online learning communities developed in work at Ultralab, (Chapman, 1996, Heppell, & Ramondt, 1998) through a dedicated Internet server. These discussion(s) will inform the essential iterative design process, of the device for the duration of the project.

All participants will be encouraged to record and illustrate specific episodes of learning in what will effectively be a collaborative online journal. At regular intervals, a summary of this dialogue will be made publicly available to inform the i3 community and to encourage collaborative debate.

The iterative design process

The design approach will iteratively develop the conceptual visual design, in conjunction with the conceptual physical design and conceptual software design via the online reference sites.

The conceptual visual design provides the opportunity for participants from the field research sites to interact with a ëvirtualí Étui before a physical prototype is created. This will enable the toy to be manipulated using software representations of the user interface. For example, although it may be intended for the physical prototype to be pushed around the floor, the ëvirtualí Étui will be ëdraggedí or ëpushedí on the screen of the computer using a mouse or touch-screen pen. 3D animations will be developed, based on initial feedback, to formulate and illustrate desirable design features and incorporate appropriate learning strategies. Where appropriate, the animations will be recorded to video and the tapes distributed to the field research sites to elicit their preferences. Designs will also be presented on the Étui web site as described above and through the media. The conceptual visual design process will lead to a conceptual physical design which will be further tested at the field research sites.

The conceptual software design will be developed in parallel with the conceptual visual design, and will initially be 'hosted' by Apple's portable eMate and Newton technology. The conceptual software design will lag behind in terms of development because it is dependent on the feedback from the conceptual visual design and the conceptual physical design consultations, as well as the online discussions.

The physical prototype will be developed and tested at the development centre(s) with a cross section of children as well as field tested at a number of schools during the last three months of the project.

Dissemination

Wide dissemination and feedback will be encouraged throughout the two years of the project. This will be facilitated via the use of a public web site. The web site will use 3D modelled images to illustrate proposed enhancements and will encourage wide and open debate concerning the development of the Étui.

The web site will also contain summaries of the evaluative discussions from the online community. The field research sites will report on the development of testing. A summary of these reports will be available on the web site. Dissemination is further discussed in section 4 of the this project programme.

Expected results

The project will produce a final prototype device illustrating:

- a range of child produced programming strategies

- rugged and 'behavioural' design

- cross-cultural user-interface providing clear demonstration of learning

- inter-device communication that supports childrens understanding of learning processes.

Other expected outcomes:

- summaries of discussion documenting learning episodes, conceptual designs and use by children from a number of field research sites (schools and families) and research reference sites across Europe;

- the results of field research sites activity;

- a public web site with ongoing discussion

- a specification for further development based on an evaluation of the project.