Teenager needs in technology enhanced learning

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ABSTRACT

This paper presents insights around designing and evaluating with teenagers from the results of two technology enhanced learning projects. The Out There in Here project reviewed technology for field based learning with teenagers compared to other age groups. The Juxtalearn project focuses primarily on teenagers using technology to create learning performances in science and technology. Initial findings reveal that methods for designing and evaluating technologies with teenagers should consider that they; thrive on diverse stimuli using a varied ecology of devices across distributed contexts, have identities tightly interwoven with rapidly changing social structures and norms, and are reforming identities into that of adults and so crave ownership interactions whilst needing safe boundaries. Current research focuses on concepts of performance (i.e. audience, purpose, improvisation or final production) as a lens for designing with teenagers the use of technology enabled creative exploration of formalised conceptual understanding

Author Keywords

Technology enhanced learning; performance; mobile learning; boundary objects; device ecology; identities.

ACM Classification Keywords

H.5.1 Multimedia Information Systems (multimedia; audio input/output); H.5.3 Group and Organization Interfaces (asynchronous interaction; synchronous interaction; computer-supported cooperative work).

INTRODUCTION

When designing and evaluating systems for teenagers we must understand their distinctness from that of children and adults. Teenagers, in particular, are developing and reforming their identities from that of a child into that of an adult. In doing this they assert their own particular tastes, relationships and responses to experiences. There as personal adaptations required here that technologies are

ideally suited to support. However in designing and developing these systems HCI researchers must carefully understand the emotive sensitivities specific to teenage participants.

BACKGROUND

Livingstone's [6,7] sociological perspective of children's (including teenagers) use of the internet identified their perception of it as a medium for communicating with local friends and information provision rather than as a route to wider societal engagement. However, the role of social structures, parents and the family was noted as crucial in understanding interactions and perceptions and researchers methods sought to capture perceptions from these co-dependent actors in the interaction. Often school-based research omits capturing teachers' perceptions and data from wider social networks and social contexts by considering the teenager as simply a self-contained end-user. The role of social structures and identities has become a growing field of interest for HCI designers [1]. For teenagers who are transforming from children into adults issues around identity reformation are paramount. Teenagers' identity is in a constant process of flux and as such social structures and norms are of paramount importance to a teenager. The role of accepting or rejecting norms provides a root to expressing their identity and technology that facilitates this can enable ownership, especially to those that feel excluded.

Mazzona et al [9] focused specifically on designing for disaffected teenagers, excluded from traditional learning, using a variation of participatory design approaches. A key finding from this research was the clear benefit of teenagers being involved in the design process as well as the end product itself. This highlights the clearly important role of the design experience as a narrative for teenagers. Dindler et al [4] have also reviewed the use of shared digital media and video for requirements gathering framed around a shared narrative (storyline) of 'a mission from mars' and the use of an 'ebag' with tools for completing the mission. The authors highlight the benefits of a 'playful inspiring framework for children and designers'. The concept of performance can be thought of as presenting different modes of interacting with a narrative. However, it is also a creative expression of the self. Technology can facilitate sharing that narrative if

it is able to cross community and social norm boundaries whilst preserving the personalised stamp of the individual.

Technology as 'boundary objects' can facilitate the performance and narratives of an individual by sharing then and traversing social structures. The object then acts as an interface that can cross boundaries of domain knowledge [11]. However, boundary objects can both enable and present barriers to understanding. Technology probes [5] can be seen as an example of boundary objects, since they traverse both end-user and researcher communities. Probes can facilitate requirements gather that is sensitive to complex social and contextual needs. However, each object facilitates different types of interactions with related benefits. Utilising multiple objects increases the potential for supporting the complexity apparent in social interactions. It is important when considering numerous boundary objects that an equally varied ontological model for an ecology of devices is utilised [8,10]. Many reviews also note the importance of social and political structures related to these objects.

METHODOLOGIES

The authors of this paper have extensive involvement in designing both formal and informal learning experiences for in-situ and mobile settings. The following are two projects that specifically highlight issues relevant to teenagers:

Distributed Fieldwork

The Out There In Here (OTIH) project [2,3] looked at distributed technology support for collaborative geo-sicence fieldwork experiences. One groups in a laboratory worked together with an outdoor field group, in real time. The project explored requirements of designing for distributed and co-located technologies (tabletops, large screen displays, tablets, mobile phones), issues of spatial coherence and deictic communication. The project also identified how technology enhanced distributed collaboration increased field-based reflections. Participants ranged from teenagers to retired members of the public.

Creative Learning Performances

The Juxtalearn project is focusing on 'performance' as a means of provoking students' curiosity and understanding of science and technology threshold concepts. Mobile technologies (data-pens, phones, tablets, cameras) are being designed to support creating performances, through film making, whilst in-situ systems (tabletops, public displays, learning analytics) will support editing, reflecting and sharing those performances to produce ever increasing circles of curiosity. Key to this development is interlink conceptual development with engaging experiences.

Some intriguing questions and tensions have emerged from our work in these two projects learning.

- How much should you scaffold a learning experience

- How do we support learning when the individual and group has complex, changing needs

- How can we support the move between personal and shared experiences

FINDINGS

The findings from the two studies identified four issues that need to be considered when developing methods for designing technologies and interactions with teenagers:

Thriving on diverse stimuli: The desire to utilise multiple streams of information, resources, experiences and interlinked devices, or else teenagers become quickly bored and lose attention with the interaction.

Rapidly changing social structures and norms: The need for interactions and technologies to be adaptable to changing social structure, networks and norms of behaviour.

Ownership and control (in identity formation): The importance of genuine ownership and control not perceived as patronizing their developing identities whilst providing safe boundaries.

Creative adaptation: Allowing roots for creative expression of teenagers growing individual identities

Thriving on diverse stimuli

From both the Out There and In Here (OTIH) and the Juxtalearn project findings teenagers were noted as thriving on what the others would consider information overload. The teenagers benefited from encountering and utilising multiple forms of stimuli in the form of information, devices and experiences (see figure 1). Teenagers were found to quickly move into boredom and listlessness without these diverse stimuli.

Figure 1: one boy encountering multiple forms of stimuli

The OTIH system required that participants interacted and utilised stimuli between distributed locations (i.e. in the laboratory and in the field). The teenagers studied benefited from a system that supported situations and collaboration that were simultaneously both co-located and distributed. In contrast the older student groups tended to benefit more from devices and a system that supported in-situ activities and co-located collaboration. These perceptions continued despite participants moving, during the trials, between the locations. Questionnaire data from the OTIH participants highlighted different levels of perceived connectedness between the two locations. Figure 2 (a and b) shows that the teenagers (i.e. Parkside participants) denoted markedly higher feelings of connection between those two locations than the other groups. One likely cause for this was the teenagers increased use of messaging in conjunction with the other parts of the system.
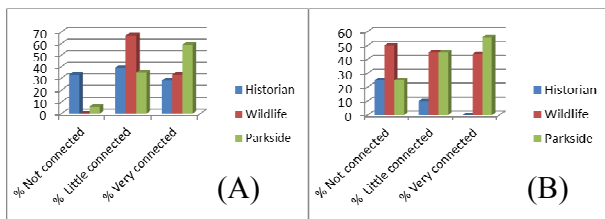
Figure 2: % perceived connection (a) outside with the lab and (b) In the lab with outside. (Parkside = teenagers, Wildlife = University students and Historian older members of the public).

Changing social structures and norms

Unlike the older participants, the teenagers merged their messaging activities with other device interactions. They would interlink sending messages, viewing the video streams, whilst watching partners' movements on the tabletop and managing information on the laptops. When teenagers online interactions were analysed in-depth there were found to not only utilised multiple stimuli but also evoked multiple modes of interaction. These modes of interaction varied from those that were task related (e.g. identifying the location of a plant) to those that were social (e.g. discovering a new experience) to those that were technically orientated (e.g. understanding a new way to use a technical device). Within online conversations teenagers were found to rapidly shift between different modes of interaction in a way that older participants did not. In table 1 we can see an expert from of a group of teenagers frequently shifting between social, task and technology moments in a way that was not observed with the older participants.

Time	Site	Message	Moment
2:07	Out2	his real name is william robert everard	Task
2:10	In2	Bavistor real name?	Task
		SOCIAL information exchange	
2:17	In2	we can see you through the camera	Technology
		SOCIAL information exchange	
2:18	In2	they're coming to you	Task
2:19	Out2	btw did u see me eat my **pringles** :P … so u cant see me now :P	Social / Technology
2:25	In2	for the grave r. b. culpin, do you know the first and middle names from on the phone?	Task
		TASK information exchange	
2:28	Out2	richard	Task
2:44	In2	we see you again !!!!!!!!!	Technology
2:49	In2	do you know the death date for amos burlignham?	Task

Table 1: Excerpt of teenage group messaging

Similar rapid movements between modes of interaction have been observed within the Juxtalearn project whereby students quickly shift between focusing on tasks into conversations about the technology (*'do you think it corrects spelling mistakes')* and into social comments.

Changing social structures and norms

Current Juxtalearn research is unpicking how technology can support the transition between individual and collaborative interactions through a lens of 'performance'. Initial studies reviewed the use of data pens to create pen-casts (figure 3) that captured conceptual understanding and creative processes whilst guiding interactions.
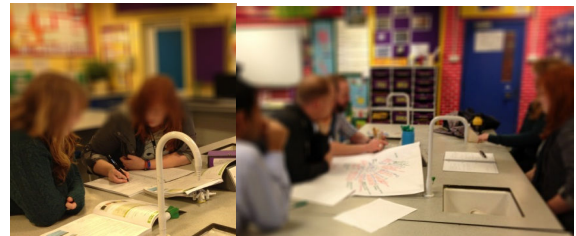

Figure 3: Teenagers using data pens to create pen-casts and as a guide to teach the teachers.

Students found using the data pens as a valuable aid to easily capturing their individual and joint thought and learning processes. However, they found it harder to use it as a boundary object aiding them teaching the teachers (Fig 3). The role reversal producing an inverted social structure was found by some teenagers to be so intimidating that it overshadowed the use of the technology or the learning process.

This highlights that when developing technology design and evaluation methods it is essential to understand how these interlink with changing social structures and norms and how much control and ownership the teenagers feel over the whole experience.

Creative adaptation

Juxtalearn (specific for teenage formal learning through creative media) has sought to advance student understanding by focusing on 'creativity' in learning through the concept of 'performance'. Whereas younger children and adults enjoy the structure of producing, refining and sharing a final performance, teenagers revel in producing interim, short and incomplete experiences. There is also less concern amongst teenagers around sharing incomplete performances (figure 4).
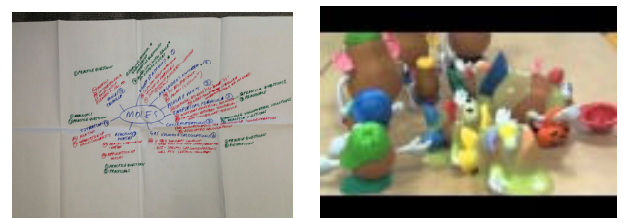

Figure 4: From pencasts to final videos

However as has already been noted, they require ownership of this experience balanced against guidance so that it is both a safe and productive performance. The use of data pens, mobile devices and tabletops provide different methods of producing learning performances and facilitate different acceptable levels of a performance.

DESIGNING FOR PERFORMANCE

Juxtalearn seeks to use the concept of performance as a means to support ownership of the learning experience and the move between personal and shared experiences. Initial findings have identified that the notion of performance is a powerful form of narrative that binds conceptual understanding together whilst motivating engagement for reflection and sharing understanding. However, we have encountered different acceptance levels of when a performance is ready to share. This is particularly evident in the notion of film making where for some the Hollywood or BBC documentary level of creativity and accuracy is expected. However, there is a growing understanding that there are multiple levels of performance akin to the shift between narratives in a blog compared to a peer reviewed journal. Though the audience maybe the same the purpose of sharing and the identities we portray are completely different. Designing systems that support and scaffold an iterative and reflective performance process can support learning across changing socio-technical needs. However, we must still design systems adaptable to changing identities and roles as we move between personal and shared performances.

CONCLUSION

This paper has presents two technology enhanced learning projects in which teenagers were a key participant in the design and evaluation process. We need to consider that in designing and evaluating for this user group there should be flexibility for teenagers to utilise multiple complex social structures, devices and information resources that are interlinked. Teenagers need designs and methods that allow for complex and rapidly changing social networks that they rely upon. In the design and evaluation teenagers need to feel they can create and weave their own pathway through the lattice of socio-technical systems. Understanding different approaches to performance narratives of support this creative weaving.

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PERSONAL BIOGRAPHY OF ATTENDEE

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