SCAFFOLDING CO-DESIGN WITH AN AMATEUR QUALITY COMIC

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ABSTRACT

This paper discusses an experiment in using a homemade comic to facilitate a visually based idea generating co-design activity with young children. The children were provided with an incomplete comic story that they were invited to complete by drawing a design idea in the final frame. The technique appears to have potential not only because of the quantity and range of ideas collected, but also because of the unexpected positive role that the children's drawings played as mediators between members of the design team. Reflections upon the case material draws on literature from a variety of fields such participatory design, activity theory, educational psychology and cultural criticism with the intention to contribute to discussions around involving children in design and of organising participatory and interdisciplinary development processes more generally.

INTRODUCTION

Children may potentially be a rich resource for developers of interactive products and services: "their freshness, imagination and technical fluency enable them to discover new creative forms" (Garzotto 2008) However many existing approaches to access this creativity require great resources.

This paper commences with discussion of various user centered and participatory design approaches and guidelines for involving children in design processes. Subsequently there is a description and reflection upon a no-budget attempt to quickly elicit design ideas from children without any specialist expertise. This took the form of asking two classes of 6-8 years old to draw the final frame of a bespoke comic created for this activity. Although the lessons that may be derived from this single case are of course limited, the Discussion section commences by outlining different ways of assessing the immediate results of the comicboarding exercise. An unexpected observation from this exercise was the observation that the real value of the children's drawings to the design team was not as a creative conceptual contribution, but as an ongoing boost to the morale of the team. A proposed explanation of this phenomena with reference to activity theory is presented. Suggestions for improvements to the exercise from both practical and ethical viewpoints concludes the discussion.

RELATED WORK

Druin advises that involving children in design requires "training children during a long term relationship" (Druin 1999). The training of users appears likely to at least reduce their "freshness" and if not actually "designing the user" (Redström 2006) then it could certainly be argued to be a form of "designing the participant" to suit the preconceptions of the design team.

Alternatively, Gibson advises finding particularly expressive or gifted children (Gibson et al 2002) but such precocious children are not always easily identifiable or necessarily the most representative resource to call upon if designing products that are aimed at children of all abilities. It seems widely agreed that methods to engage children in almost any form of participation in design activity (from cocreation to usability testing), should be tailored to them for they are "not young adults but a special user group" (Deeming 2004).

Iversen challenges the notion that "designing with children is a distinct design discipline" (Iversen 2005) arguing that "users' age and cognitive abilities do not affect the general structure of participatory design but only the techniques applied" (Ibid). Iversen's argument

maybe probed by viewing it in light of Kensing & Blomberg's principles of participatory design (Kensing & Blomberg 1998). Most of the five conditions they stipulate for participants in participatory design can be discerned in much of the work of Druin and the other practitioners who involved children discussed here. However the fifth need for participants, that there is "room for alternative technical and organizational arrangments" (ibid) is not detectable in Iversen's approach. The design might be **with** children, but the process is designed **by** adult designers/researchers. However this is also an accusation can be levelled at many activities labelled participatory design generally, not just those involving children.

CHILDREN AND DESIGNS UNITED BY DRAWING

One undoubted difference between adults and younger children relates to drawing. Children reduce their spontaneity of drawing after they are 8 years old. This phenomenon was captured by Picasso when he said: "Every child is an artist. The problem is how to remain an artist once he grows up" (in Picasso & Bernadac 2002 p222). Ability and comfort in drawing is also a characteristic of most design professionals (Buxton 2007) and children participating in design workshops have reported that drawing was one of their favourite aspects (Guha et al 2004 p38). Thus developing further ways of supporting larger numbers of children in making a contribution to design through drawing their ideas seems a promising route to for "bridging the gap" (Grudin 1991) between users and designers.

COMICBOARDING

Moraveji et al (2007) report upon success in using various comic book formats to engage children with no prior experience of, nor obvious aptitude for brainstorming activity. Their experiments deployed, in expertly drawn comics, characters and plotlines from well known comic books, but with key frames of the story removed. Citing inspiration from the developmental psychologist Vygotsky (in Berk and Hare 1995) they claim to have "scaffolded" the idea generating process with such incomplete comics. In Moraveji's project for Microsoft, children implicitly suggested design ideas by giving instructions to a professional comic artist on a one-to-one basis as to what to draw in the blank frames.

LIMITATIONS OF PROFESSIONAL COMICBOARDING

The services of a professional comic book artist may not always be affordable for design teams, but if children could be encouraged to produce their own drawings as solutions to design problems, then a comic book scaffold could potentially be a means to elicit a large number of design ideas in a relatively short period of user contact. Given that children reduce their spontaneity of drawing after they are 8 years old (Bornholt & Ingram 2001) facilitating children drawing their own design ideas seemed a particularly promising approach for those below this age.

CASE MATERIAL

The context for this trial was a five weeks (part-time) portion of a postgraduate course in user centered design. This module at the University of Southern Denmark was organized in collaboration with the local electric utility *Syd Energi.* The author (who has a background in interactive arts) was working in a team of five with colleagues from engineering and engineering management backgrounds. This project team had the task of developing design concepts for domestic electricity metering devices that would encourage the reduction of energy consumption. The project brief stipulated that the devices should encourage whole households - including the very youngest members of a family, to participate in attempts to save electricity.

GENERATIONAL, CULTURAL AND LANGUAGE CHALLENGES

With a mean age of 29 years, none of the team members considered themselves "digital natives" (Prensky 2001 p2). Thus it appeared likely that children's knowledge, inclinations and expectations in regards to technology appeared likely to have changed greatly in the years since any of the project team members were children themselves. Furthermore, 80% of the project team members grew up in countries other than Denmark and had had very little-to-no contact with Danish children since coming to study in Denmark. This seemed a fairly extreme example of how "users and designers have different backgrounds and belong to different communities of practice" (Iversen 2005 p25). Therefore, at the earliest possible stage of developing device concepts, the team agreed it was necessary to gain an insight into the culture of Danish children and explore the design of an energy consumption meter from their perspective.

An arrangement was made with a local school to allow the project team brief access to two classes of 6-8 year old children for 40 minutes. Given that only one project team member had proficiency in the Danish language, visually based facilitation techniques seemed most appropriate as a means to bridge the language barrier in order to maximise the productivity of the contact time.

"HANNAH AND THE INVENTOR"

The author wrote and drew a *comicboard* that told the story a family in which the 7 year old girl and her parents were keen on measuring saving energy, but the girl's 4 year old brother was too young to understand. To address this, the girl has an idea that her little brother's enthusiasm for toys could be directed towards energy saving, if their inventor neighbour could be persuaded to invent something that combined play and energy saving. The inventor agrees to build something, but says that he does not know anything about children's toys so he asks the girl to describe a playful energy saving device he could create. The final panel is left blank with an instruction inviting the reader to answer this request by drawing a suggestion for what the inventor should build.

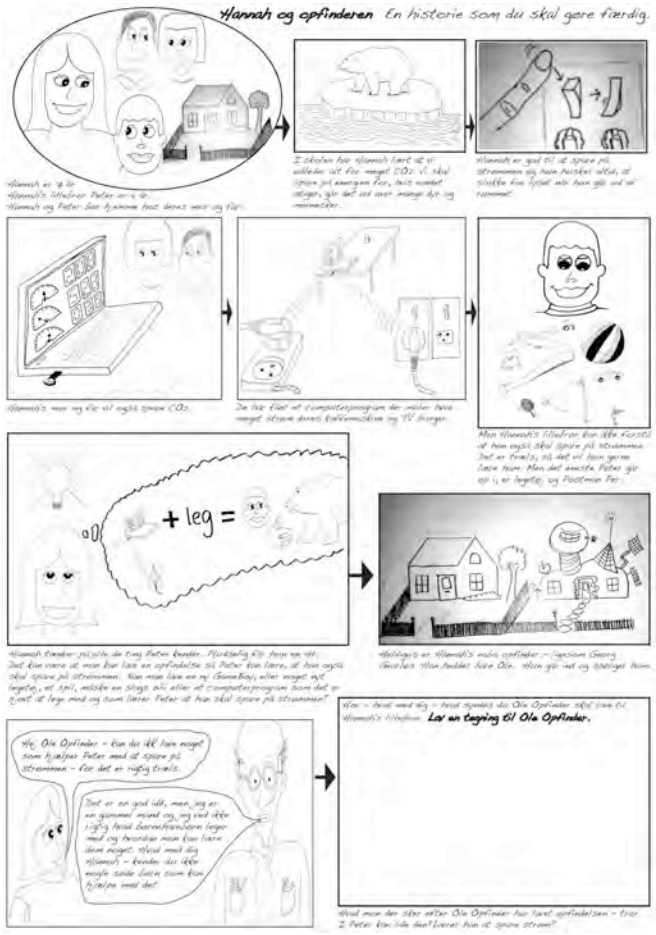

Figure 1. The A3 comicboard.

Modifying the behaviour of younger children was an aspiration that it was hoped that most children were familiar with. Focusing on modifying the behaviour of younger children also seemed a promising tactic in that it reduced the possibility of the cartoon reader feeling any implied criticism of their own current practice.

STAGING OF ACTIVITY

Upon arrival at the school it was confirmed that not all of the children were confident readers. Therefore the comic was first read out loud to all 30 children, whilst displaying a large scale version of the relevant accompanying picture panel (Fig.2).

Figure 2. Telling the comic story to all participants

Figure 3. Participants queuing up to receive their comic board.

Then the aims and hopes for the exercise were explained to them before the pupils enthusiastically queued up to collect their own A3 sized copy of the comic (Fig. 3) and returned to their own classroom where they sat down to draw.

RESULTS

Drawings to complete the cartoon were received from all but one of the workshop participants. The project team was startled by the range of ideas the children produced.

To briefly summaries the range of the contributed design ideas that were interpreted from these 29 drawings, the children's concepts can be grouped into seven broad areas, with several ideas falling into two or more of these categories. These areas were as follows: energy saving alarms (both audio and/or visual, automated energy savers (e.g. Figs 4 - 6), wearables (e.g. Figs 5 - 6), restrictions on ability to enjoy pleasures (such as playing outdoors or access to toy cupboards) if energy not saved (e.g. Fig. 7), energy generators (e.g. Fig. 8), automated electricity savers (e.g. Fig. 9 & Fig 11) handheld computer game consoles (e.g. Fig. 10) and emotion evoking devices (Fig. 12),

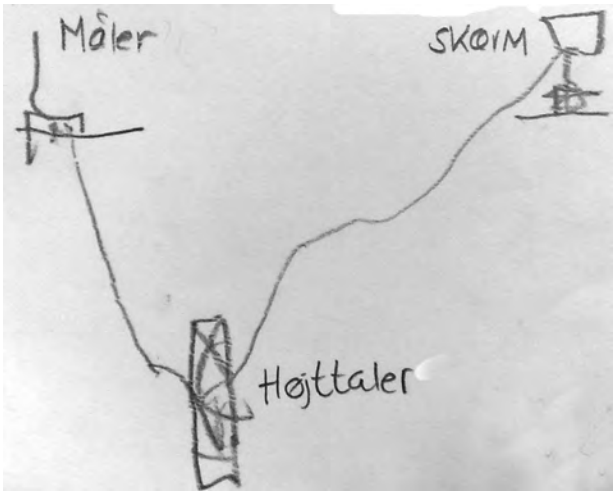

Figure 4. Alarm if excess power is consumed

Figure 5. A flashing wristband alarm

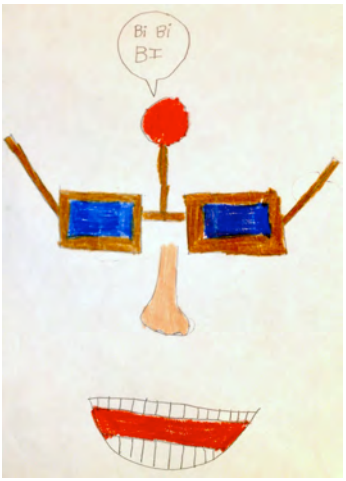

Figure 6. Glasses that beep and flash if too much power is consumed

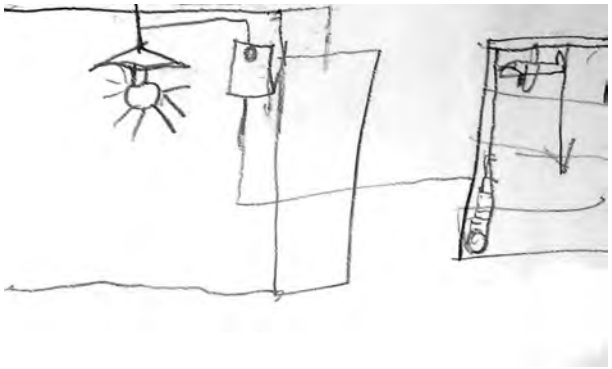

Figure 7. Toy cupboard that will not open if too many lights are left on

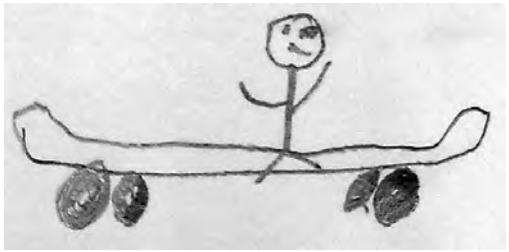

Figure 8. A skateboard to generate power

Figure 9. A movement sensor to detect lights left on

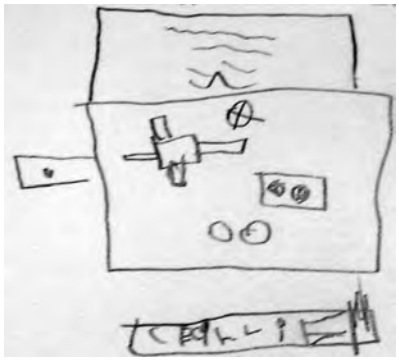

Figure 10. Handheld computer game that measures power

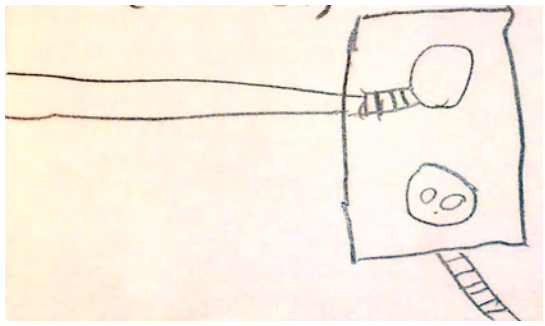

Figure 11. An automated power saver

Figure 12. A robot that appears happy or sad, depending upon whether energy is wasted

This academic assignment was principally concerned with how to involve users in the design process. The development of design ideas beyond rough concepts was beyond the scope of this project. However it is hoped that reflecting upon the children's contributions and its aftermath from a more detached level will contribute to discussions concerning involving children in design and the potency of user generated design artefacts more generally.

IMPLICATIONS

The wide variety of ideas resulting from the comicboard activity gives credence to the notion proposed by Moraveji (ibid) discussed above that involving a small number of children in participatory design is not likely to lead to representative results. Although this exercise occurred at an early stage of a project where there was a wish to generate large number of ideas - with adaptation, a similar technique could be considered as a route to address creative "blocks" at different stages of a project, even one not aiming at the design of devices intended for use by children.

APPROPRIATE TECHNOLOGY

One of the arguments collected by Olsson (2002) as reasons not to involve people in participatory design was that users "do not know the potential of new technologies". This might seem particularly pertinent to the case of children. Others such as Kristensson (2002) in speaking about users generally say that knowledge of the relevant technology can be a "burden against creativity (ibid p60). In this instance by comparison with the graduate students of the project team, there appeared little gap in the understandings of potential technologies. There were no technologies that the students had discussed prior to the comic workshop which were not suggested by the drawings of the children. This is in line with the advice offered by a London user experience seminar which exhorted: "Do not underestimate how technically savvy children are" (Deeming 2004 p3).

Although all suggestions were technologically possible, the commercial feasibility of many of the contributed concepts such as powering a metering device through bouncing a ball or riding a skateboard (Fig 8) was a little low. This echoes the experience of Sciafe and Rogers (1999) in their much lengthier co-design sessions: "On the one hand, kids come up with many wonderful suggestions that the design team would not have come up with…on the other hand, many of their ideas are completely unworkable" (ibid p4).

UNCERTAIN INTERPRETATIONS

With many of the children's drawings the device or system that they invented was fairly clear to behold from either the drawing alone or from a combination of the drawing and a brief explanation that they gave. Other drawings though, required more effort on the part of the design team to translate a contribution into what the project team considered a design concept (e.g. Fig 13 & 14).

Figure 13. An ambiguous design concept

Figure 14. Another ambiguous design concept

MULTIPLICITY OF MEANINGS

It is over simplistic to consider that there was only one correct interpretation of the more ambiguous drawings. It is quite likely that the ideas of contributors themselves developed as they made their drawings. Professional designers are exhorted to use sketching as a way to develop ideas, which may change as they take shape on paper and upon later review and discussion (Buxton 2007 passim). It is plausible to assume that there exists a similar dialogue between concept and its visible manifestation whatever the age of the sketcher. As Rubin wrote in an art therapy context: "Even if it turns out that one's initial guess about meaning was correct, one should not assume that any image 'always' means something specific, nor even that its significance is invariant over time for any particular person" (Rubin 1984 p128).

This does not preclude that the project team mistranslated any of the drawings, since the author and colleagues are likely to have fallen into the trap identified by Sciaffe & Rogers of assuming that we could "understand what the kids are getting at" (ibid) whilst neglecting to consider that: "Kids have a different conceptual framework and terminology than adults" (ibid).

MISCOMMUNICATION IS NORMAL

The anthropologist Geertz argues that “it is not necessary to know everything in order to understand something (Geertz 1973 p20) and as Van Deurzen Smith, reminds us, there is no such thing as perfect understanding between people, "In some ways all human communication is based on error and difference" (Van Deurzen-Smith 1997 p225). And these errors are something she sees value in: "Mishaps and confusions bind us together as well as bind us apart” (ibid). Ambiguity is proposed to be a valuable resource for designers by some interaction researchers. Gaver et al (2003) were writing about user experiences of products and systems when they postulated that ambiguity can be "intriguing, mysterious, and delightful”(ibid p1). These words find an echo in the writings of the artist and educationalist Oxlade who contrasting technically accomplished drawing with the more spontaneous, proclaimed that the latter leaves people "intrigued, charmed, interested, moved by other human beings and can show us unexpected aspects of human existence" (Oxlade 2001 p3). A design concept from the children that was unclear to the project team was in some ways more valuable than the easily comprehended because they inspired more discussion and engagement with the drawing by different team members. The ambiguity of the children's drawings did seem to have a binding effect within the project team as discussed below.

VALUING PARTICIPANT DERIVED DESIGN IDEAS

The author spent around thirty hours developing their drawing skills and producing the comic. It seems reasonable to assume that a moderately imaginative person devoting an equivalent amount of time to individually generating design concepts may have come up with a range of design concepts that approached the total generated by the children. However, such a quantity of concepts by a single team member is unlikely to have been seriously considered by the other team members. Prior to the workshop the author proposed several possible design directions including the idea that the energy meter should incorporate a facility to generate electricity by kinetic means. These proposed concepts were rejected by the other team members. However when similar concepts resurfaced in the drawings of the children, they were enthusiastically taken up by many of the team members who had previously had little enthusiasm for design directions that involved dynamos.

NON DISCIPLINARY PROVENANCE OF A CONCEPT

Activity theory maybe called upon the illuminate why such provenance matters. Since these drawings were user created artefacts, the drawings belonged to the design team as a whole, unlike a sketch produced by individual team members. Activity theory proposes that tools are “exteriorized” versions of thought processes (Fjeld et al 2002). In everyday parlance, it is more common to speak of using tools to make objects or images. Activity Theory however shows how all the artefacts produced and used during the design process, such as sketches and prototypes can also be considered as tools. Any tool can be said to embody to embody, to varying degrees, the knowledge, experience and/or values of their creators (Bannon 2002). Such manifestations of other people’s values can be either implicit or explicit but are likely to be present in any such tool or artefact. This is important to remember because as Eriksen and Linde (2006) explain, artefacts “drive design” (ibid p1). They also go on to say it is rarely contested that artefacts have an “important role” (ibid p4) to play in facilitating dialogue across and between different disciplines involved in the design process. An area worthy of further investigation generally is how the origin or ownership of an artefact might affect the reception of such “boundary objects” (Star & Griesemer 1999).

In interdisciplinary design, practitioners from different disciplines have different methods or tools at their disposal. It is typically the designer or perhaps the anthropologist, who produces design artefacts and brings them to the workshop table. Creating tools which are common to all team members thus may offer one route to establish a good common ground for interdisciplinary collaboration.

CHILDREN ADDING FUN AND MOTIVATION

Sciafe & Rogers report that “Kids ideas are most useful in helping us to design the motivating and fun aspects” of a design (1999). In the case of *Hannah and the Inventor* however, the effect was not so much of usefulness as an emotional effect. The encounter at the school was agreed by project team members to have increased our motivation, particularly the amount of fun that we had with the project. It is impossible to separate and give weight to different possible motivation enhancing factors such as the novelty of encountering the children, experiencing their environment or the actual results of the design activity itself. However, the fact that the contributed drawings continued to be handled and referred to in discussions amongst project team members in the subsequent weeks of the project inspires the following speculations as to their value as mediating artefacts within a design team.

SHOWING, TELLING AND MAKING

The influential design researcher Liz Sanders facilitates user contributions to designs through workshops deploying bespoke kits of colourful stationery materials. She stresses that users can be better understood through a combination of perceiving and analysing what users *say*, *do* and *make* (Sanders 2001) in such workshops. The different actions and articulations support and feed into each other, but need to be captured and understood as a whole – particularly since many adult participants have less skill and experience in creative visual expression. The verbal fluency that they use to explain their actions and creations within the workshop thus requires recording and/transcription in order to be accessible to researchers. An individual child’s

drawings however, can be argued to encapsulate what they *say, do* and *make* in a single, compact physical artefact. Vygotsky (in Berk & Winsler 1995) argues that for children, play, art and narrative are overlapping activities. This is in line with the author's recollection of his own experience as a child when he and his contemporaries would happily while away hours telling action stories through drawings (both individual and collective) which would both inspire and be inspired by physical play. In most cases such drawings were done to enjoy the process of figuring out a story rather than intending the drawing to be displayed as a picture.

Although too much can be read into these personal experiences, it certainly seems plausible to propose that in a nutshell, it can be said that children tell (or *say*) narratives as they *do* and through the drawings they *make*. This might then go somewhere to explain the potency of children's drawings in the described exercise.

Haughney et al report on success in using the "*visual language of comics"* as a method of relaying insights gleaned through qualitative exploratory interviews with users (Haughney 2008). If users, such as children of a certain age, are comfortable with drawing and can thus provide visually perceivable design artefacts, then such drawings offers a more direct version of Haughney's technique as a means of passing on and continuing to be inspired by encounters with users throughout the life cycle of a design project.

IMPROVING COMICBOARDING

This section briefly discusses how this comicboarding exercise might have been improved both as design technique and also highlights some ethical concerns.

EFFECTIVENESS AS A DESIGN TECHNIQUE

There are many possibilities by which this technique may be enhanced as a means to inspire and capture children's design concepts and insights into their attitudes towards the problem area. Pre-testing a comic with a smaller group of children and involving children in the design and production of the comic itself are just two means by which the likelihood of providing the appropriate degree of scaffolding to participants' creativity might be increased. Facilitating children to compare and discuss possible combinations of their different ideas would give an insight into how children viewed each others' ideas as well as generate improvements to concepts and generate new ideas. For Guha et al, such an activity is a vital stage of their cooperative inquiry process which they call "mixing things up" (Guha et al 2004). Multiple cameras set up to video record could provide a means to preserve concepts and feature ideas that participants did not incorporate into their drawings. This could also glean an insight into how children felt about their concepts, and how their idea development may have been shaped by contact with each other, or any of the adults present. However, the comic exercise was developed as means to enable rapid facilitation by researchers who did not speak the children's language. In order to implement the enhancements mentioned above would require greater time and other resources such as translators - both on site and to review video material. Comics are far from the only means though to scaffold a quick creative activity. In this respect a more careful consideration of what a comic offers compared to other techniques such as those recently developed by Joaquim Halse in what he calls a "fieldshop" (a compressed combination of workshop and field study) involving puppets (Binder et al 2010) and after Brandt & Grunnet (2002); physical props as "things to act with" (ibid p3).

REFINING THE FRAMEWORK

Some kind of loose financial or physical scale limits might help the contributed design concepts to be more practical. The limits of such a design brief could and should be phrased in terms understandable by children. For instance the inventor in the story could stipulate that his workshop is quite small in size, so that the new invention would have to fit through a small doorway. Providing bricolage materials might offer an alternative means to guide the scale of devices in contributed concepts. Limitations in price or complexity could be loosely suggested by explaining that the inventor could only build something that was not much more expensive than a television, or some other easily recognized device.

ETHICAL CONSIDERATIONS

In working with any potentially vulnerable group such as children, the impact of any novel exercise should be considered from their perspective and their interests. In this case the project team considered the pupils to be contributors to an educational project rather than as subjects in an experiment. Indeed, from a long term environmental perspective, the energy reduction goals of this project could be seen as more in the interests of the children's generation than that of the graduate students.

However, Guha has reported that children of this age group can become upset if they perceive design researchers ignoring or modifying their ideas since they can find it difficult to "let go" of their concepts (Guha et al 2005 p40). The comicboarding exercise described in this paper, was in some ways more extreme in that the children's drawn concepts were taken away and not returned. It was both discourteous and unprofessional of the project team to have not undertaken any follow up correspondence with the children. Practitioners considering similar exercise should consider embedding such courtesies in their project timetables.

According to Perkins (2005), the acknowledgement of authorship should also be a cornerstone of professional design ethics. In this instance, although the project team did not attempt to pass off the children's creativity as their own, the absence of rigorously recording which child was responsible for which drawing meant that the authorship of their concepts was anonymous.

Transcribing names and demographics details of contributors could also be of benefit to researchers analysing children's drawings and it is thus recommended that such information is recorded.

CONCLUSION

This paper has described how, on the basis of a limited trial, a non professionally produced comic appears to offer potential as a low budget means of scaffolding design concept generation with young children. The contributions from children in the case material have been discussed in regards to various viewpoints. Suggestions have been made as to how to improve such an activity. Explanations have been offered as to how children's drawings maybe a special instance of the representation tools and tangible materials used in the design process. The comicboarding exercise might seem to be simple and quick activity, but it has raised many issues and resulted in many unexpected observations. This serves as reminder that participation, like interaction and user experience cannot be directly designed itself, but can only be designed **for.**

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