LEARNING HCI IN THE LOST WORLD

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ABSTRACT

Instead of a formal examination, HCI students completed part of their assessment in a local video game parlour. It is one of the few places where a large group of students can experience participant observation of technology in its everyday situation of use. In this paper we discuss some of the usability issues that were identified during the evaluations as well as the pedagogical insights that resulted for the students and staff involved. It was clear that while the students could identify specific problems, they had difficulty, describing and critiquing the structure of the interaction in the various games and moving between general usability principles and specific examples in context. However, their experience demonstrated vividly the differences between evaluating technology inside and outside of its everyday context and between observation of, and participation in, the use of the technology being evaluated.

KEYWORDS: Usability issues, HCI education, usability evaluation, video games, learning, pleasure

1. INTRODUCTION

'Computer games, we must admit, can be silly, stupid, childish, and wasteful of time. But the harsh competitive environment in which games designers operate has nourished the development of sound concepts of user interface design. The serious student of interface design could spend a profitable afternoon playing games—for evaluative purposes, of course'. (Crawford, 1990, p. 111)

It is an ongoing challenge to decide what must be, and can be, learned when only a single subject in HCI is available within a degree program. Our intention is to maximise the breadth and richness of the field introduced to our students, while ensuring that basic principles of user-centred design are well understood. In the current absence of local opportunities for further formal study in HCI, our hope is that interested students will gain the basic foundations to enable them to pursue further learning of its principles and practices themselves. Others should at least know enough to recognise the importance of centrally involving users in the design process and to avoid making major usability errors in their own technology design practices. It will be no surprise to the HCI community that we rely on iterative approaches to the subject design and development process to improve the learning opportunities available to our students. In this paper we consider just some of the results when, instead of either a quiz in a lab or a formal examination, HCI students completed part of their assessment in a video game parlour in a local shopping centre.

Currently, a single, undergraduate HCI subject is offered as an elective to third and fourth year IT students and another is offered at postgraduate level. HCI has only recently been reintroduced to the curriculum and, when this assessment was completed, both subjects were taught together as only 33 students in total were enrolled. The subjects have a strong design orientation and cover basic introductory issues round user-centred design, as well as usability design principles and some evaluation methods. The various assignments in the subjects are designed to develop students' design and scenario development

skills as well as their ability to perceive and critique the interaction design in technology they encounter as they go about their lives. The focus is on understanding work practice as the basis for designing technology that is both useable and useful in its situation of use.

The assessment discussed here was deliberately developed to enable students to evaluate technology in its actual, everyday use. The assessment was held in week 12 of a 14 week semester and we had hoped that it would support reflection on the experience that fitted our pedagogical commitments to how design can be learned (Schön, 1987; Lave and Wenger, 1991). A previous effort to approximate a genuine use situation in the student labs had worked reasonably successfully as an assessment exercise, but it provided little opportunity for further learning for the students because so little actual use context could be included. The big advantage of video game parlours is that they exist in order for people to use the technology within them. They offered the only place we could think of where we could take 33 students to observe and use technology in its everyday context without interrupting the work of the organisation. The assessment was designed so that students could demonstrate their understanding of general usability principles, such as consistency, learnability, naturalness, flexibility etc, that are introduced in most HCI text books (e.g. usability principles from Preece et al. 1994, Macauley, 1995 and Sommerville 1995 were introduced and compared in the subject), as well as their ability to identify and describe different interaction styles, relations between input and output mappings, and how these various aspects of technology design structure how specific technology can be used over time in a particular setting.

Students could play and/or observe any game during a two hour period and each needed to gain a reasonable familiarity with at least three different games to complete the assessment questions. They could use any of their subject materials they chose and were encouraged to work cooperatively. Students were required to answer four questions, each of which was divided into several smaller parts. In each question students were asked to briefly describe the goals of the games. The first three questions each focused on the evaluation of specific aspects of three different games; including the actions that were represented, how these were represented and what kinds of feedback were provided to the users. In the last question, the students were required to design a four player, beach volleyball game, specifying the new game's interaction dialogue, input/output mappings and feedback mechanisms.

Because our space here is limited, we cannot give a full discussion of how the students fared in their usability evaluations. Instead, in the following section we report the results of just one part of one question with the aim of relating this detailed account to our more general findings from the study. From there we consider these findings in the light of our pedagogical concerns and describe how they have motivated the redesign of some of the learning resources and priorities in the subject. Finally we muse, briefly, about the potential contribution HCI subjects can make to broader strategies for placing usability and associated issues in the centre of technology design and development cultures.

2. USABILITY PROBLEMS IN ACTION GAMES

Students were asked to both observe and play one of seven specified games. These had been grouped because they were all examples of classic arcade action games (Pausch et al., 1994, p. 178). Clanton (1998) described action games as requiring 'perceptual and motor skills to drive, fly, run around and act in a world. Different tactics are needed to defeat different enemies and a strategy must be devised to win' (p. 1). Examples of action games include sports games, flying and driving games and shooting games. Using Gould's (1996) five broad categories of interaction styles (discrete, continuous, concrete, character and resonant), these games all exploited a concrete style of interaction, where a player literally reaches into a game world and directly acts within it. One of the games was based on big game hunting and, interestingly, no one played it. Two of the games (including one called The Lost World) involved two players shooting different kinds of attacking monsters and 13 of the students played these. The others were single-user, sport and/or driving, games involving a racing car (six players), a taxi (four players), a street luge (six players) and a skateboard (two players).

The first part of the question asked students to describe the input/output dialogue and explain how this structured the specific game they were playing. Speaking very broadly, input was well described, output less so and very few provided any explanation of how the relation between the two structured the game. Then they were asked to suggest, with justification, two changes that might improve the usability of the

game. Between them students suggested 64 changes that, on our inspection, settled reasonably comfortably into just six broad areas. Table 1 summarises these areas and the numbers of suggestions for each. With only a couple of exceptions, these 64 suggested changes were not the same suggestions—we had after all encouraged students to cooperate—but were potential solutions to the same kinds of problems. It is important to emphasise that the areas of improvement, identified in Table 1, were not predefined but came from the patterns in the data. Moreover, we do not consider these as hard and fast categorisations but, instead, convenient ways to group the students' suggestions to support some general analysis about their interactions with this technology. We do not consider specific numbers particularly relevant but are most interested in the relative numbers and the specific suggestions for each kind of issue.

TABLE 1

SUMMARY OF USABILITY IMPROVEMENTS SUGGESTED

Area Needing Improvement	# Suggestions
Inconsistent or inappropriate mappings	18
Learnability	15
Ergonomics	13
Problems with input device	11
Alter rules/constraints of the game	4
Cultural issues	3

Inconsistent or inappropriate mappings included: indiscernible changes in the different views of the game world the player could select; not being able to tell if your player was dead, if so how that had happened, or if, in fact, the game had ended; difficulty in distinguishing specific feedback to user action from the activity going on within the rest of the game world; the use of different colours to mean the same thing in different stages of the game. Some suggestions that we have categorised as inconsistent or inappropriate mappings were very specific to particular games. For example, a chair was used as the input device for the street luge game and several students suggested that a luge—where the player would be lying down—would have mapped more realistically into the game world.

Some of the identified mapping problems related strongly to learnability issues because they affected the students ability to understand the effect their actions had on the game and what options were available to them at different stages. Suggestions we have specifically categorised as learnability issues mostly asked for extra, clearer or more detailed instructions—particularly on how to start the game and move through its levels if available, the opportunity for practice runs or the removal of some input devices that appeared to have little or no identifiable function, although they may have been broken.

Most of the suggestions that we have categorised as ergonomic were about the difficulty of hearing specific sound output from the game, both because of the placing of speakers—on the ground instead of head height, the noise from other games and the general noisiness of video parlours generally. Students expressed surprise that the use of sound, for both initial instruction and ongoing feedback, was so important to the games they were playing when video game parlours are, almost by definition, noisy. Other suggestions included sharper screen displays, more light over the instructions, different placing of input devices, or redesigning parts of the game apparatus to be movable to fit different body sizes. Two students suggested rest periods during long games to reduce strain on arms and/or fingers.

The students identified problems with input devices that were cumbersome, fixed, when movable would have been preferred, or clumsy and difficult to control. For example, the skateboard game used a skateboard as its input device that was larger than a regular skateboard and awkward to control with the sensitivity needed to safely navigate the game world. Four of the eight suggestions for improvements in input devices asked for better maintenance as the devices were either obviously broken, or not mapping correctly to the place on the screen where they were directed.

Only four students offered suggestions for changes to a game's rules, or constraints, that they argued would improve the quality of the gaming experience itself, though interestingly, one expressed uncertainty about whether this was a usability issue. Finally, one student suggested that players could select the language used in instructions and game feedback while two suggested that the usability of the left-hand drive car racing game could be improved by changing the controls around to fit the right-hand driving protocols more familiar to Australian drivers.

We have included this detail about the students' suggestions for usability improvements for two reasons. One is to provide the reader, who may be unfamiliar with video games, with some feel for the context we are discussing here. Another is to demonstrate how concrete and specific the suggestions were to the particular games they were playing, the game apparatus itself, and to the relations between the particular games they were playing and the rest of the activity within the video game parlour. The issues the students wanted solved by their suggestions are all easily identifiable as violations of standard usability principles and design heuristics. Yet there was no indication of reflection on these principles, nor any sign they had been used heuristically by the students to identify and frame their suggestions for improvements.

3. LEARNING USABILITY DESIGN AND EVALUATION SKILLS

Our major insight was that the students did not appear to be able to explicitly use usability design principles, or heuristics, to evaluate specific examples of technology in use. Nor were most able to identify specific usability problems as examples of failures to observe these same principles or heuristics in the design of the technology they were evaluating. Yet the usability problems the students did identify were genuine and significant, and their suggestions for solving them were almost always appropriate.

Prior to the assessment, the students had been given extensive practice evaluating a range of technology. One of their assessments required weekly critiques of technology they encountered as they went about their lives, including applications they used, vending machines, mobile phones and handheld devices. Moreover, their classes in the four weeks preceding the assessment were all devoted to usability design principles and evaluation methods and had included a number of exercises. For example, they had spent a whole session evaluating each others' developing web-site design assignments (the major assignment in the subject). A guest lecturer, from local industry, had also brought along the storyboards, supporting materials and processes from a genuine web-site development and had guided the students, in small groups, through a usability evaluation of the developing site. Their critical skills were reasonably sound yet were still clearly limited to concrete examples and there was little evidence that the students could relate the concrete example to the broader principle.

The fact that the students had to complete their assessment within half an hour of finishing their two hour access to the video games accounts for much the lack of polish and evidence of reflection and abstraction in their answers. Some evidence for this was provided by their feedback during the following week, which we will return to later in this section. The redesigned assessment for use this year provides more structuring for them to progress from the specific example to the general principle, as well as a section to be competed without time constraints during the following week. But there are other reasons that we suspect are also part of the explanation and these too have implications for our future teaching and subject redesign.

Traditional categorisations of interaction styles have opposed command line to graphic, with a special focus on direct manipulation interfaces. Yet the students clearly required a finer-grained vocabulary for describing the interaction styles of the various games they evaluated. All the games used a direct manipulation interaction style which meant that it was not a particularly helpful categorisation in

practice. While this issue had been addressed in one of the subject readings and class presentations (Frohlich, 1997), we have redesigned the section of the subject that supports learning about interaction styles to reflect the wider range of computing devices the students may encounter, such as those included within Gould's (1996) categorisations of interaction styles, voice driven systems and small devices that require nested menus.

Another possible contributing factor to the students problems evaluating the video games could be that the ubiquity of the window-based applications they use in their work bounds their thinking about HCI issues in other kinds of technology—as if HCI only applies to existing business applications or, at most, web-based applications. If this is the case then we have a classic learning transfer problem that may be only partially addressed within a single subject. Given the rapid development of information technology in the past 20 years, and given that the students are just beginning careers in the field that may last 30-40 years, it is certain that they will be designing and implementing information technology with different kinds of interfaces and interaction styles to those available to them now. This is an argument for the importance of learning basic usability design principles rather than specific application-based design rules, but it is equally an argument for linking these principles to specific examples of their application in as wide a range of situated technology as can be gathered.

Perhaps the most satisfying result of the assessment was the evidence of the students' reflection on their assessment experiences through the ensuing week. At their next class some still wore the yellow plastic wrist band that had gained them access to the games the week before and many arrived with comments and questions. The most common request was for a review of the learning material from class sessions on designing in context, that had included gaining insight into the work practices of potential users and evaluating developing technology in its normal use context. Students wanted to know how the complexity of interaction within its situation of use could be captured, analysed and reflected on, and discussions focused on the use of video recording, in situ interviewing, ethnographic studies and other ways of understanding actual work practice.

When asked how it would be different if The Lost World was removed from the games parlour and set up for evaluation in a usability lab, the students were able to give a remarkably clear and insightful account of what would be gained and lost in such an exercise. They recognised how heavily the environment of the game parlour itself affected how they understood and used the games they played and evaluated within it and how some findings from evaluation in the usability lab would not necessarily be valid or useful in actual use. At the same time they recognised how quickly everything moved in the actual use context and how a quieter, more specialised, evaluation environment could offer them the opportunities to fully explore alternative design options. Moreover, it was at this point that they were able to begin articulating the links between usability design and evaluation principles and heuristics and the specific usability issues they had identified the week before. It was at this point, too, that they demonstrated a change in how they perceived their relationship to the technology they encountered from finding separate and unrelated problems to finding specific instances of broader principles of design and use. Perhaps the greatest advantage of substituting the video game parlour visit for the final examination was that it was held during semester and there was time to revisit and reflect on what their experience had taught them before the subject had finished (Schön, 1987).

Finally, our experiences reported here provide a strong argument against moves to reduce HCI design and usability evaluation to checklists of design principles and usability heuristics. This is not to say that we do not realise the enormous value of these principles and heuristics. We do. And we remain committed to teaching them. But it is to recognise that the ability to translate these principles and heuristics into specific design requirements, and to recognise the more general principle in the concrete usability problem, is neither a straightforward nor a trivial process. Most importantly, it is also to recognise that the ability to ground these principles and heuristics in actual situations of use is a basic part of the professional design skills for HCI and usability practitioners.

4. A BRIEF, CONCLUDING DISCUSSION ON BEING 'COOL'

We must own up to another motive behind the assessment task discussed here. We are committed to positioning the study of HCI within IT faculties as one of the activities that is considered 'cool' within

the various social and cultural value systems that our students—particularly our undergraduate students—both shape and are shaped by. It has not required a great deal of participant observation to understand that the prevailing student cultural norms around 'coolness' privilege heavy technical subjects and the pursuit of technology-fed design and development that is judged on its own terms. Yet we found that earlier assessments involving interaction and interface design of applications for hand held devices had gained some 'coolness' currency for the subject and attracted some of the most competent technical students to enrol. This excursion, to complete an exam in a video game parlour, was definitely regarded as 'cool', was written about in the campus newspaper and was named by a third of the students as the part of the subject they most enjoyed (and was in the top three of all but two subject evaluations). This year the numbers enrolled in HCI have trebled and the undergraduate and postgraduate classes are being taught separately. We will use a similar assessment this year , revised and expanded by the insight's gained from last year's experience.

On a broader scale, the newest gadget and the most grunt have historically been unchallenged as the arbiters of 'cool' in technology design and development environments. We wonder if contesting what counts as 'cool' in these environments could be a valuable addition to the more established strategies, such as arguments for the economic benefits of HCI, in the development of more participatory, socially valuable, useable and useful technology.

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