DOES IT MATTER WHO IS HOLDING THE PDA IN A MOBILE LEARNING EXPERIENCE?

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ABSTRACT

Mobile technologies, such as PDAs, are increasingly being used to create innovative mobile learning experiences for children. Collaboration around use of the PDA has been identified as a key benefit. In this paper we identify the issue of whether it matters who is holding the PDA, and in particular whether there are gender effects at play. We present a preliminary study where we examine the behavior of pairs of children using PDAs in a literacy fieldtrip according to which member the pair held possession of the PDA at any time and whether PDA use influenced who initiated action. Our results indicate that initiating action could be independent of technology 'ownership' for girls, but that for boys initiating action might be more heavily influenced by who was holding the PDA. However, these findings are based on a limited sample and are indicative only. The main contribution of this paper then is to highlight the issue of possible gender effects on how PDAs are used in mobile learning experiences and point to areas for future research to understand how collaborative interactions take place and whether or not it does matter who is holding the PDA.

KEYWORDS

Mobile learning, field trip, collaboration, PDAs, gender, focus.

1. INTRODUCTION

Ubiquitous and mobile technologies such as Personal Digital Assistants (PDAs) have been used for a variety of mobile learning activities from scientific enquiry (Li 2002) to creative writing (Halloran et al 2006, Weal et al 2007) and there is a growing body of literature reflecting on the lessons learnt resulting, for example, in 'evidence-based' guidelines for strategic level issues such as cost, usability, technical and institutional support (O'Malley et al 2003). Collaborative and group learning in particular is mentioned as a key benefit of using handhelds in mobile learning (BECTA 2003, O'Malley et al 2003). However, while there are a growing number of reports of different aspects of mobile learning, very few have focused on the details of *how* the collaborative interactions take place around PDAs, and in particular the role that gender might play in those interactions.

Schwabe et al (2005), for example, show that teams of two or three are better than individual users or larger teams for increasing fun and learning in mobile learning contexts. While Danesh et al (2001) explored handheld applications for collaborative use by children, they focused mostly on the design of the device interface and the functionality required to support collaboration rather than on actual use in trial. Where people do focus on using the tools, the emphasis is often on the overall outcomes and the ways in which handheld devices engage children in the learning process (Rogers et al 2005) rather than on specific details of the interactions themselves. There is then a lack of information on the specific ways in which children

actually use handheld devices for collaborative exploratory learning. One exception to this is the growing interest in issues of focus and attention, which have been identified as being potentially problematic for all mobile applications (e.g., Kristoffersen and Ljungberg 1999) and are now beginning to be explored in relation to mobile learning. For example, Goth et al (2006) report: *"Instead of interacting with the environment, we found the learners interacting with the device, heads down and ignoring the environment. We found the issue of focus to be a massive problem"*. The study to be reported here looks at one issue of focus around interactions occurring within pairs of learners using a wireless PDA: will holding the PDA draw attention or focus away from actively determining what the pair did next?

We are also interested in gender and while gender bias in the use of ICT in the classroom is well documented (see Howe (1997) for a review), gender issues in the context of collaboration/mobile learning have received little attention. One mention is in the BECTA (2003) report where, through interviews with teachers and pupils, the authors suggest an *"absence of significant gender bias"* and that PDAs can help break down *"the 'IT is for boys' syndrome"* (p18). The BECTA paper is supported to some extent by a Prinsen et al (2007) who undertook a structured review of five computer supported collaborative learning (CSCL) papers. Whilst there is variation in the studies, general trends were identified with respect to gender: *"females tend to share their intuitive conceptions while males post more authoritative statements.... One study found that females initiated more discussions."* This one study was by Li (2002) who found that females initiated conversation through asking for information rather than through making suggestions, where there was no gender difference. Prinsen et al (2007) also note that, in those studies where gender equity in computer mediated communication (CMC) was apparent, the focus was on *"inclusiveness ... productive discussion ... creating a learning community"*. Studies of CSCL showed greater gender equity than studies of CMC but still with differences: female students were more inclined to share their ideas, initiate discussion and request information, while boys tended to make more authoritative statements and provide information to others more often. Hence another question in our study is whether there are gender effects around PDA use in collaborative mobile learning situations, as a different type of CSCL.

In this paper we present a preliminary study that reports an analysis of pairs of pre-adolescent children (10-11 years) interacting around a PDA as part of a literacy fieldtrip in the Chawton House project. The analysis indicates that overall learners could be more likely to initiate action if they are holding the PDA; this is understandable since the PDA delivers instructions. However there are also suggestions that there could be a gender effect whereby girls could be less influenced than boys by who is holding the PDA. These findings, however, are based on small and unbalanced numbers and need further exploration and verification through rigorous study.

The *main contribution* from this paper then is to highlight the issue of possible effects from gender on how use PDAs impact collaborative mobile learning interactions and to present directions for further research. This research would be important since, should effects be found to hold, there could be significant implications for educational design. This is particularly apparent where children are being encouraged to develop qualities such as initiative, self efficacy and leadership, i.e., asserting their own goals on the learning experience. It might well be important that each boy gets equal time with the technology so as to develop their own authority within the group. Further research is needed to understand whether this difference is robust under different educational demands.

We go on here to first review the literature on collaborative mobile learning, then introduce the Chawton House project, and describe the study and results.

2.   CHAWTON HOUSE PROJECT: FIELD STUDY AND METHODS

The study reported here is based on data collected during two field studies conducted as part of the Chawton House Project. In brief, Chawton House is a literary centre located in a historic home with associations with English novelist Jane Austin. The aim of the project was to explore the potential of novel ubiquitous technologies to support a different type of exploratory outdoor learning – to provide inspiration for creative writing through playful exploration in the grounds of the home – and in particular to work with teachers to design the tools and resources for them to create these learning experiences (Weal et al 2007). This was an innovative turn as most are largely one-off experiences run by researchers and focussed on scientific enquiry (e.g., see Rogers et al 2005).

Two one-day field trials were conducted in the summer of 2005 and 2006. Each trial consisted of two phases in the grounds of the house followed by a writing session back in the classroom (see Halloran et al (2006) for more details). On each day, three pairs of children, aged 10-11 years, walked around the grounds with an ensemble of technologies, including GPS positioning, PDA devices and wireless networks. Five were same-gender pairs (three of girls, two of boys) and one was mixed gender (Girl 3 and Boy 8). Each pair had one PDA to share. The children managed the sharing of the devices themselves, initiating within each pair when they wanted to swap over the PDA – typically about three times during the exercise. The teachers had previously devised scenarios where being in specific locations in the grounds would trigger different activities to be sent to the children's PDAs to stimulate inspiration for story writing (e.g., for plot, characters, setting etc). These activities included role playing, imagining different times and seasons, describing sights, smells, sounds, and so on. Some activities required them to discuss things with each other, to write in their note books (pen and paper) or to record audio or text on their PDAs. The materials they gathered were later re-presented to the children in the classroom where they began their story writing. Overall, both the children and teachers found the field trip highly engaging and the teachers rated the children's stories as significantly more sophisticated and developed than any they had written through normal classroom activities (Halloran et al 2006).

Data was captured in a variety of ways, including the logging of all network traffic to and from the PDAs. Here we only focus on the video data. During the trials, each pair of children was accompanied by a researcher who video-recorded their interactions. This resulted in 12 hours of video (approx 2 hours for each pair). Results from one pair of boys ended up being excluded from the analysis because of persistent problems they had with the technology, which essentially resulted in a very different set of trouble-shooting rather than learning activities that were not directly comparable with the others in the terms of this study.

The video of the remaining 5 pairs was analyzed by coding each member of the pair for *initiating an action*. We considered that a new action was initiated when someone suggested a change in activity by saying something like – 'let's go over here', or 'let's have a look at those horses', or 'shall we do the role play now – who do you want to be?' etc. We also recorded gestures that clearly indicated a new action. For example it sometimes occurred that the children were considering where to go next and one child would just gesture by pointing in a direction and off they would go. We did not differentiate between gestural and verbal initiations in the coding. We also did not consider repeated statements toward the same goal in the same time frame as initiating two or more actions; in these cases the first statement only was coded. Coding was done using a simple table system for each video. The table had two columns, one for each child taking part. The video was played and whenever an action was initiated a mark was made according to the child who initiated the action and whether the child had the PDA or not. Table 1 below represents the collated counts of action initiations per child. Coding was performed by one coder only. Reliability was checked by recoding one video some weeks after initial coding, with very close agreement.

3. RESULTS

Descriptive statistics are set out in the following table, giving the raw count for each child initiating action with and without the PDA and providing a mean count based on gender. We did not conduct inferential statistics - though a result may have attained statistical 'significance', the implication of certainty would be misleading given the small numbers and lack of gender balance across the pairs.

Table 1. Raw counts of action initiation for each of the seven girls and three boys, according to individual, gender and device use

	Holding PDA when initiating action	Not holding PDA when initiating action
Girl 1	15	11
Girl 2	16	11
Girl 3	13	19
Girl 4	4	9
Girl 5	11	3
Girl 6	6	5
Girl 7	14	16

TOTAL GIRLS	79 (Mean initiation 11.3)	74 (Mean initiation 10.6)
Boy 1	16	2
Boy 2	13	6
Boy 3	15	8
TOTAL BOYS	44 (Mean initiation 14.7)	16 (Mean initiation 5.3)
TOTAL (ALL)	123	90

Overall it appears that learners could be more likely to initiate action when they are holding the PDA (123 cf 90). This is understandable since the PDA has been used to deliver a location-sensitive instruction and the person holding it is more likely to read it and communicate the action to their partner. However it also appears that there could be a gender effect. When holding the PDA the boys show a slight increase in action initiation compared to the girls (mean 14.7 cf 11.3). In addition the girls show very little difference between PDA and non-PDA use (11.3 cf 10.6) whereas the boys show a large decline in action initiation when they are not holding the PDA (mean 14.7 cf 5.3).

4. DISCUSSION

These findings are indicative rather than conclusive because of the obvious limitations of the study given the small numbers, and the difference in numbers of girls and boys overall. Also, the field trips were conducted in authentic environments and the initial focus of the trials was on the teachers' involvement in designing mobile learning experiences not on setting up experimental conditions to test gender effects; the analysis of the video data for action initiation patterns has been undertaken as an opportunistic post-hoc analysis.

However, taken as whole, the results appear to be consistent with themes found in the literature on children, gender and technology. The literature does indicate that dominance hierarchies are more defined for boys than girls (Rose and Rudolph 2006) and an association exists between technology use, boys, and statements of authority. So it is possible that, for the boys, being a PDA holder conferred authority and through that the situation demanded they direct action more. For the girls the literature indicates a general trend to greater discussion with no particular indication toward assertiveness or authoritative statements (Prinsen et al 2007). Thus the girls may be more productive than boys as far as speech acts go and, given there is no particular biasing effect of the technology for girls, the types of speech acts would be expected to be similar regardless of technology use.

As such, while preliminary, these findings do serve to highlight the question of whether there are gender effects on PDA use and initiating action as an issue worth exploring further through rigorous trial design and statistical validation: with larger numbers of children, balancing the mix of genders, and taking more explicit account of the mix of genders in pairs and also between pair effects. Other factors that could be included are whether the children have previously worked together or not, the personality profiles of the children, the amount of time each child held the PDA and its relation to action initiation, the types of activities suggested via the PDA and if these had specific influences from type of PDA prompt with action initiation, and differences between gesture and speech initiations.

Such research would be important because if it is found that initiating actions could be independent of technology use for girls, but dependent on technology use for boys, then there are implications for educational design, particularly for boys. If it is the case that we wish to encourage equity amongst boys will it be important that technology (here a PDA) be shared equally in terms of the time given for each boy to act as the controller of the technology to avoid issues of disproportionate authority and status? For girls, if the attachment of authority through technology control is less apparent, then does a teacher need to control less for technology use as a contributor to hierarchical practices within pairs of girls but more when organizing mixed-gender activities?

In conclusion, while collaboration has been identified as a key feature of mobile learning experiences, little work has been conducted to unpack how devices and activities play out in the collaboration. The findings from this preliminary study suggest that gender differences in action initiation based on who is holding the PDA might be one of the collaboration issues to be unpacked in an ongoing research agenda. Better understanding how gender differences play out in relation to device use will help with developing guidelines for how best to deploy these technologies in mobile learning situations.

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