Setting the Stage for Collaborative Interactions: Exploration of Separate Control of Shared Space

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Abstract: Most educational software available to children is designed for a single user and this, coupled with a shortage of computers in schools, means that pairs or groups of children often share an inappropriate interface which can be detrimental to collaboration. We describe a novel user interface, Separate Control of Shared Space (SCOSS), and present two studies that explore its potential as a tool to resource collaborative interactions. We illustrate how it can be used to allow for equitable control at both input and task levels, and how it visually represents agreement and disagreement which can be used to mediate collaboration about a final solution.

1. Introduction

Much of the software that is used in classrooms is designed for a single user but is often shared between pairs or small groups. Teachers often promote ‘sharing’ as being a desirable behaviour and encourage children to take turns with the input device, but this often results in co-operation (e.g. [1]) rather than collaboration. Co-operation can be defined as task-sharing, but when this breaks down, there is the potential for one child to dominate the other and to complete the task without conferring with their partner.

Scott, Shoemaker and Inkpen [2] have found that the provision of multiple mice does not improve the likelihood of concurrent interaction between children. We argue that this is because the software interface used in their study allowed only one child to have access to each feature at any one time, thus promoting turn-taking rather than concurrent task activity. Likewise, Benford, Bederson and Akesson et al [3] report that children using KidPad with a mouse each co-operated effectively on task-sharing but that reciprocal discussion was minimal, compared to children who were asked to share a single mouse. We argue that this is a function of the KidPad interface and of the task: the children are given the option of distributing task elements between them, which they complete separately.

Another field of research that addresses the issue of interface design to support collaboration is Computer Supported Collaborative Learning. For example, Suthers [e.g. 4] explores how the design of representational tools can support students’ collaborative discourse. We argue that although this interface, and others developed in this field (e.g. [5]), is designed to mediate collaborative interactions, there is the possibility of one student dominating the other by deleting and over-riding their partner’s contribution without any discussion.
2. Separate Control of Shared Space: Features

To overcome some of these limitations, our interface, Separate Control of Shared Space (SCOSS), enforces each person to engage with the task. It provides each user with their own space and each child can control only elements within their own space; it is not possible to delete their partner’s work, which is what single user interfaces, even with dual control, are unable to do. Dual control of a single user interface results in users taking it in turns to move a single representation of each element on the screen, whereas the SCOSS interface allows for equity at both input and task-process levels which gives each user the potential for becoming engaged with each and every element of the task. However, the SCOSS interface can only provide users with opportunities for equity in the task process; the amount exerted is up to individual users. We have also included a ‘we agree’ feature on the SCOSS interface and this can be adapted to different tasks (at the programming stage) so that agreement can occur at pre-defined stages or upon completion of the whole task.

3. Study One

The main aim of study one was to compare the utility of the SCOSS interface with single control of a single user interface, and dual control of a single user interface. The focus was on determining whether children could use SCOSS as a tool to mediate their collaborative progress through the task. The SCOSS interface was studied in a simple task in which thirty six pairs of 8-9 year olds were asked to estimate the number of sweets in eight containers (e.g. a small box, a large jar).

In condition A the children shared a single-user interface: they shared a single keyboard and their estimates were represented on a single scale. There was one ‘we agree’ key to be pressed to indicate that the children agreed on their estimates at each stage of the estimation process. In condition B the children used an interface that represented dual input into single user software (as used by [2] and discussed above). The children saw the same interface on the screen as in condition A, but each child had their own set of designated keys. In Condition C the pairs used the SCOSS interface. Each child had their own set of keys (as in B) but they also had their own space in which to work along with their own agree key to indicate when they were in agreement on their final estimate.

Video footage was coded using a scheme that identified whether collaboration was occurring in terms of evidence of 1) justification of opinions/answers, 2) joint understanding, 3) joint agreement, 4) working towards a shared goal, 5) equal opportunity to contribute to the task and 6) equitable opportunity for input. Analysis revealed that there was no difference in the quality of the collaboration across the three conditions: with the exception of 2 pairs of children, all pairs were poor collaborators due to either failing to provide justifications for their estimates (15 pairs), and/or failing to work towards a shared goal (1 pair) and/or one child dominating the proceedings (3 pairs). This indicates that some children are not spontaneously good at collaboration and confirms our hypothesis that SCOSS alone cannot mediate the quality of the discussion surrounding decisions. However, there is video evidence of the potential for the SCOSS interface to mediate joint decision-making by making agreement and disagreement visually explicit.

4. Study Two: SCOSS with discussion prompts.

A further study investigated the utility of the SCOSS interface in mediating collaboration between 10 parent and 5/6-year-old child pairs in the home context. This study focused on parents and children completing an activity where they completed weight
and mass tasks. ‘Frankie’s Fruitful Journey’ was designed by O’Connor [6] to incorporate the principles of the SC OSS interface that have been discussed above. This software also incorporated the use of discussion prompts to scaffold the quality of the collaboration (see [7] for details).

Observations of the conversations indicated that neither the adult nor the child dominated the decision-making process. All participants made different choices from their partner in the first part of each task indicating that the SC OSS interface supported individual decision making actions and enforced participation. All the adults used the visual representation of agreement and disagreement provided on the interface by physically pointing out differences on the screen to focus the attention of the child.

5. Discussion

These studies have demonstrated the potential for the novel user interface - Separate Control of Shared Space - to mediate collaborative interactions. It is effective in setting the stage for: individual agency at input and task-process levels, representing agreement and disagreement, and mediating eventual agreement. These interface features can be used as a resource by users to mediate their conversation. The addition of discussion prompts effectively scaffolds collaborative conversations so that interchanges are more rich and contain more examples of users explaining and accounting for their decisions. This, in turn, means that there is a higher level of joint understanding between users.

In future research we would like to explore the issue of task dominance more closely. We plan to investigate whether training and practice in both collaborative skills and use of the SC OSS interface would be of benefit to child-child pairs. Furthermore, we have realised the potential of the SC OSS interface as a tool to provide data about individual contributions to the task, which can be used by a learner model which in turn can offer further scaffolding for the collaborative process. This future work will help us to build upon that reported here and enable us to realise the full potential of the SC OSS interface.

References