Teaching Rhetorical Skills with a Tangible User Interface

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ABSTRACT

We describe Webkit, an application which uses a large-screen graphical user interface and a tangible user interface to teach children important rhetorical skills. We discuss our evaluation of this application and possible future directions for computer-supported rhetorical applications.

Author Keywords

Rhetoric, Tangibles, RFID, Children, Computer Supported Collaborative Argument, Education, Iterative Design.

ACM Classification Keywords

H.5.3 Group and Organization Interfaces: Collaborative computing and Computer-supported cooperative work*;* K.3.1 Computer Uses in Education: Collaborative learning.

INTRODUCTION

Few people can get through life without the need to create a persuasive argument. Whether one is making a bid for a job, a student place at university, or a business loan, persuasive skills are critical to success in the modern world [3]. These abilities are familiar today as presentation skills, public relations or 'spin'. However, they are not an invention of the media age; the importance of persuasive argument was recognized by the ancient Greeks, who taught the skills required for political and personal success via the discipline of rhetoric [1].

In this paper, we describe a novel application, Webkit, which supports the teaching of rhetorical skills to school children, using both a tangible and a graphical user interface. We discuss other combined TUI/GUI applications for storytelling, and existing applications for supporting argumentation for adults. Finally we review our findings from evaluations of the Webkit application with school children in the classroom, and suggest some future directions for TUI-supported rhetorical applications.

THE WEBKIT PROJECT

This paper presents an extensive interface design programme undertaken as part of the ongoing European Union-funded Webkit project. The Webkit project includes 10 partner organizations, both academic and commercial, from several countries within and immediately neighbouring the EU (UK, Italy, Greece, Poland, Switzerland).

The aim of Webkit is to explore applications of tangible user interfaces (TUIs) to the World Wide Web, with particular focus on applications for school children. The project aims to develop novel TUIs and applications through a process of iterative user-centred design. Because we were working in English schools, we found it necessary to focus and constrain our design activity further, to ensure that while children were participating in our research sessions, they were at the same time able to achieve learning goals set out in the English National Curriculum [12]. The method we developed for designing in schools within the constraints of the English school system is called Curriculum Focused Design (See [13] for details). We chose to focus on a curriculum area we have called JADE; Justifying Argument based on Discussion and Evidence (Dave Pratt and Amanda Simpson, personal communication). This led us to investigate existing educational materials for teaching formal argument and debating skills, and thus to the origins of rhetorical teaching.

THE TEACHING OF RHETORIC

In their major textbook on rhetoric, Corbett and Connors [8] identify three main areas of the rhetorical process:

- Discovery of Arguments: identifying information and opinions relevant to the topic in question (what we usually call 'research');
- Arrangement of Material: deciding on the best way to structure and order the relevant information and opinions;
- Style: the business of delivering the structured material in the most effective manner possible.

The student of rhetoric is not expected to tackle these three areas unaided and all at once. Since ancient times the teaching of rhetoric has focused on a graduated sequence of rhetorical assignments known as the progymnasmata [8]. One of the most famous sets of progymnasmata was that set out by Aphthionius of Antioch circa 400AD. Aphthionius's list of exercises covers the entire spectrum of rhetorical skill including some of the following (in order of increasing difficulty):

- Fable: a retelling of a folk tale;
- Narrative: a telling of an original story;
- Encomium: a speech expanding on the virtues of a person or idea;
- Vituperation (or Invective): a speech expanding on the evils of a person or idea;
- Thesis: a speech in which a point of view is defended but the opposing point of view is thoroughly considered;
- Legislation: a speech in which the student is asked to oppose or support the introduction of a law.

Each of these exercises is further broken down into a series of manageable steps. For example an encomium in praise of a person would be further broken down into the following stages: [17]

- Describe the stock a person comes from;
- Describe the person's upbringing;
- Describe the person's deeds;
- Make a favorable comparison to someone else to escalate your praise;
- Conclude with an epilogue including either an exhortation to your hearers to emulate this person, or a prayer.

By providing this rigid structure the progymnasmata greatly simplify the rhetorical process which the student needs to complete. In our encomium example, the discovery of an argument is reduced merely to a requirement to answer a series of pointed questions. These questions also take the student from some background and history, through the most pertinent facts to a resounding finish, thereby tackling some of the most difficult aspects of the arrangement of the material. What is left to the student, however, is perhaps the hardest rhetorical challenge, the business of turning an outline structure into *prose*. For prose is always is the required output of a rhetorical exercise, whether in the form of a speech or an essay.

THE WEBKIT APPLICATION

Webkit is an application which provides support for all three phases of the rhetorical process identified by Corbett and Connors: *discovery of arguments*, *arrangement of material,* and *style,* i.e. the delivery of material as either a speech or a written text. Webkit supports these aspects of rhetoric with a combination of tangible and graphical user interfaces.

The 'Discovery of Arguments' Phase

Children using the Webkit interface are given a collection of printouts of web pages deemed by the teacher to be broadly relevant to the discursive topic. In the initial research phase, a group of six to eight children are given a topic for discussion, for example 'Is graffiti art or vandalism?' They are then asked by the teacher to read through the printouts and come up with a series of *statements* relevant to the question, supported by the material that they have read. They are asked to record these statements, together with the URL of the web page that gave rise to the statement. At the end of this initial research session these statements are collected by the teacher. The Webkit application is then configured with these statements and URLs. Each of the statements is printed out and placed in a *statement card* (See Figure 1). Each statement card contains a unique radio-frequency identification tag (RFID) and is also equipped with a small light-emitting diode (LED) which lights to indicate when the statement card is being read by an RFID-reading radio antenna.

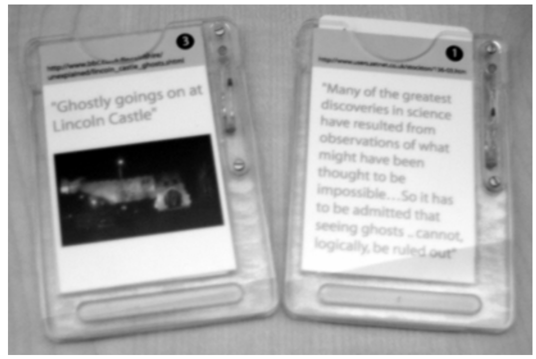

Figure 1. Statement Holder

The 'Arrangement of Material' Phase

Once the children have completed this research phase they must begin to organize their material. Figure 2 shows a plan layout of the Webkit application. The application consists of a set of five *argument squares* each of which contains an RFID-reading antenna; a 'magnifying glass' square which also contains an RFID-reading antenna and a projection screen onto which the graphical user interface is projected.

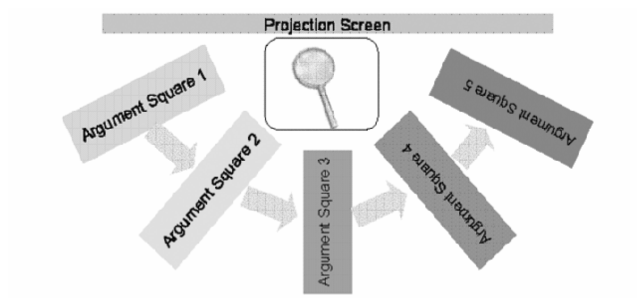

Figure 2. Argument path with GUI and TUI

The children are given a series of statement cards that hold the statements that they produced in their earlier research session. They are introduced to the argument squares, each labeled with an argument stage. Our argument stages are based on the ancient models of encomium, vituperation and thesis. So for instance, these were the encomium argument squares for the graffiti debate:

- Say something good about graffiti
- Say something good about people who do graffiti
- Compare graffiti to some other kind of art
- Say why other people should do graffiti
- Summarise

The children work through the argument-creation process three times in total. The encomium exercise is followed by a further set of argument squares enabling the creation of a one-sided argument *against* the topic of debate (vituperation). They then progress to a final exercise (thesis), which enables them to create a more balanced argument, either for or against the topic, depending on what they decide to argue. This gives them an opportunity to explore each side of a debate by constructing two simple one-sided arguments, before progressing to the more difficult task of creating a balanced but persuasive case for one point of view.

For each of these three exercises, children are asked to arrange the statement cards on the argument squares so that the material on each argument square fits the argument square prompt. For example on the argument square 'Say something good about graffiti' the children might place the statement 'Some graffiti has been shown in art galleries'. While arranging the statements, they might notice they have no evidence to support a particular argument square. In this case they can return to the 'Discovery of Arguments' phase to do further research.

As the children place the statement cards on the argument squares, the RFID tag is read by the RFID-reading antenna in the argument square. A beeping sound is played to indicate that the statement has been recognized by the Webkit application. A thumbnail of the webpage which gave rise to the statement is then shown on the overview screen which is the default screen for the Webkit application (See Figure 3)

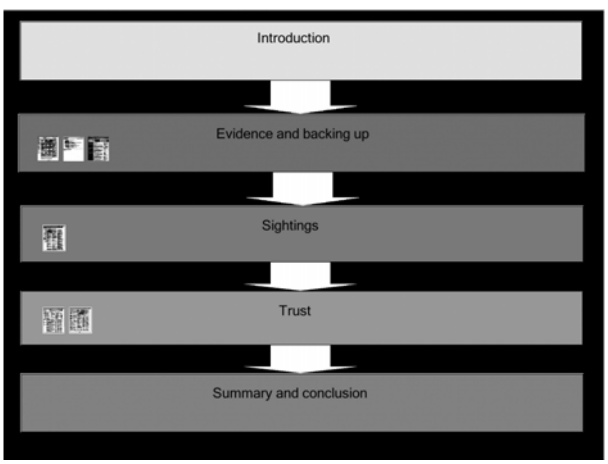

Figure 3. The Webkit Overview Screen

The function of this screen is primarily to provide the children with feedback indicating that their arrangement of statement cards on the argument squares is being tracked by the system. (Earlier prototypes which did not have a GUI showed that without this kind of feedback the children seemed to lose interest in arranging the statement cards). A secondary function is to give the children an overview of the overall distribution of statements across the argument squares and therefore the full length of the argument. This enables them to see which argument squares are relatively lacking in material and therefore need further research and discussion.

At any time during this 'arrangement of material' phase, children can place one of the statement cards on the 'Magnifying Glass' reader. The result of this action is that the screen changes to the source detail screen (see Figure 4). This screen shows a full-sized view of the web page which gave rise to the statement card currently on the magnifying glass.

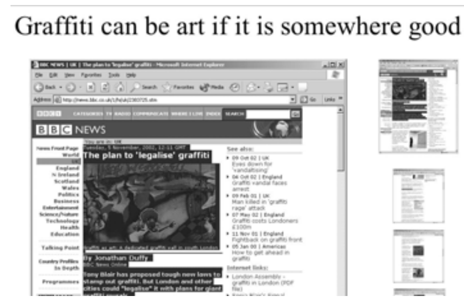

Figure 4. The Source Detail Screen

The 'Style' Phase

For this final phase, the children are asked by the teacher to deliver a speech following the stages of the argument, using the statements they have chosen. A special card called the speaker tag is used (See Figure 5).

Figure 5. The Speaker Tag

Placing the speaker tag on one of the argument squares causes the screen to change to a detailed screen such as that shown in Figure 6. This screen shows the title of the argument square followed by a bulleted list of the statements which are currently place on that square. The order of the statements is the order in which they were placed on the argument square. In our earlier work, we found that children tend to put down first the statement they regard as most obvious and important [16]; hence this assumed order of importance is captured by the order on the detailed screen.

The children 'walk' the speaker tag across the argument squares from first to last as they deliver their speech and at each stage the GUI presents a bulleted list of their statements in the order that they were placed on the argument square. Thus the children are encouraged to move through their own arrangement of material to present their argument. By providing them at each stage with an ordered list of points, the Webkit TUI and GUI together provide strong support for the difficult challenge of linearization – turning structured research in linear prose.

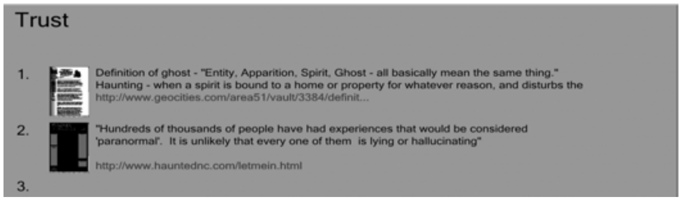

Figure 6. Webkit Detailed Screen

RELATED WORK

Computer Support for Rhetoric

A review of HCI literature reveals some existing work to support activities at both ends of the rhetorical spectrum discussed above. While the authors whose work we discuss do not identify their educational concerns in terms of rhetoric, there are important points of contact between their research and our focus on computer support for rhetorical education.

Storytelling

Listening to and telling stories are important activities for younger children. Stories aid the development of imagination, collaboration, and the child's emerging sense of self, as well as the more obviously educational benefits of improving skills in listening, verbalizing, reading and writing. Perhaps unsurprisingly, researchers building story-based applications for children have not all been inspired by the same aspects of story-telling and its associated benefits for child development and education. For example, Benford et al [4] have developed an application called Kidstory, with the primary aim of encouraging children to collaborate. They provide a detailed argument and evidence for the case that TUIs, especially those on a large scale, can be designed to encourage meaningful collaboration, which otherwise probably would not occur.

Ananny's TellTale is a caterpillar-like TUI which also provides support for story-telling [2]. Each section of the caterpillar can store up to 20 seconds of audio. These segments can be reconfigured to permit creative and collaborative play. This interface is novel in that it permits the user to reorder story segments, allowing for reflection and revision. Ananny's interface is fairly closely aligned with rhetorical concerns, as it is explicitly designed to encourage language development across the oral-written continuum.

Cassell and Ryokai [7] have developed a sophisticated TUI-based application, StoryMat, in which children are able to create characters who both listen to and tell different kinds of stories. These authors see the primary benefits of story-telling, and of StoryMat, as being an opportunity for children to explore their own 'problem' experiences (in areas like learning, school, bullying, or religion) through imaginary scenarios and characters, thus promoting the children's understanding of themselves in the social world. However, Cassell and Ryokai also comment that '…storytelling skills are essential bridges to written literacy and so in our future research we would like to explicitly investigate the intermediate links that can allow children to become as fluent writers as they are speakers.'

As this review shows, developing rhetorical skills has not tended to form the main focus of story-telling applications designed for younger children. On the other hand, developers of story-telling applications have pointed towards the possibility of supporting speaking and writing skills for somewhat older children, and for moving beyond simple narrative to other forms of composition.

Computer-Supported Cooperative Argument and Argument Visualization

At the opposite end of the spectrum of rhetorical difficulty there also exists a substantial body of research on interfaces to facilitate the process of complex argumentation by adults. For example, van Gelder [18] describes a system called Reason!Able, a GUI-based diagrammatic system, manipulated by a skilled facilitator, which enables participants in a discussion to keep track of all the claims and counter-claims made, and any supporting evidence cited. The resulting diagram, which is revised collaboratively at intervals throughout the discussion, not only represents claims, counter-claims and evidence, but also represents the logical relationships between them. The diagram reduces each participant's memory load, and provides a visible common reference point for all participants, saving time and cognitive effort, and providing a clear focus for debate.

A similar approach to supporting adult argumentation activity is that of Buckingham Shum et al [6]. Like Reason!Able, these authors' application, ClaiMaker, aims to explicate the logic of complex arguments by labelling contributions as belonging to different classes (claim, counter-claim, evidence etc), and representing diagrammatically the logical relationships between the contributions.

Two interesting assumptions of both Buckingham Shum et al's work and van Gelder's Reason!Able application, which we question, are firstly that mapping an argument requires a *logical* notation (see comments below on a real argument about Robin Hood), and secondly that the end product of mapping an argument should be a *diagram*. While recognising the importance of diagrams in aiding communication on complex topics, we have some reservations about diagrams as the main documentary output of a debate. The main medium of communication for arguments and ideas is still prose, especially among so-called knowledge-workers, and this seems unlikely to change, regardless of other changes in communicative conventions to accommodate technological innovations [10]. The final record of any important debate, whether an industrial dispute or an academic discourse, will usually be in the form of prose documents.

CHILDREN'S ARGUMENT CONSTRUCTION

We engaged in a range of exploratory information-gathering, brainstorming and design activities, aimed at generating ideas for TUIs that might support debate in the classroom. We looked at various potential lesson topics for debate and relevant urls, provided by our education research partners at Warwick, and all selected for their relevance to a curriculum area currently being studied by children in our target school. The topics we considered were:

- 'If you lived in mediaeval England, would you rather be a peasant living in a village or town, or one of Robin Hood's merry men?'
- 'Do ghosts exist?'
- 'Graffiti: is it art or vandalism?'

We proceeded to develop and test our ideas in the context of a real school environment. To gather insights about how our application might support children's work effectively, we began by observing how a group of children tackled a discursive question, given a set of printed web pages on the topic of debate. We assumed initially that children would need help with understanding and representing the logical relationships in discursive material. However this assumption was radically challenged by our observations of this group of children, fundamentally altering our approach to designing an application to support their activities.

We set up a series of three 50-minute lessons at weekly intervals for a group of five 11-year-old children in Year 7 (their first year in secondary school). The group included three girls and two boys. The lessons were facilitated by a researcher with 10 years' teaching experience, and were filmed by another researcher. The children were studying mediaeval England as a topic in their history lessons, and this provided the background for their discussion question on Robin Hood (see above).

Support Needed for Rhetoric not Logic

After spending about 15 minutes quietly reading printed web pages, the children started talking about the material, and generated several arguments in the course of their conversation. We present below the generation and development of the most interesting and detailed of these arguments.

- Girl 1: "What did Robin Hood actually do?"
- Girl 2: "Save people."
- Boy 1: "Steal from the rich and give to the poor."
- Girl 1: "So if Robin Hood likes you, and you're a peasant, that might be quite good."
- Boy 1: "But what if you got caught?"
- Girl 1: "But *you* wouldn't get caught, Robin Hood would get caught."

This snippet of discussion reveals three important points about the way the children dealt with the material. Firstly, the logic of the argument is quite sophisticated, but it was generated very rapidly and all the children appeared to follow it without any difficulty, on the basis of their shared knowledge of the web page material.

Secondly, several of the premises and a large chunk of the reasoning required to reach the conclusion were left implicit in what was actually said. For the argument fully to make sense, one needs to be aware (as the children all were by this stage of the discussion) of the following facts:

- peasants were poor;
- most crimes in mediaeval England were punishable by torture or death, so 'getting caught' was to be avoided at all costs.

One also needs to draw out these implications of the argument, unstated by the children, but recognized by all of them:

- If you were a peasant, then because you were poor, Robin Hood might give you some of the money he stole.
- Being one of Robin Hood's merry men was potentially riskier than being a peasant, because the merry men were more likely than the peasants to be implicated in crime.
- Therefore, it might be better to be a peasant than to be a merry man.

Thirdly, while it initially appeared that the children had abandoned this argument to move on to new material, later in the session it emerged that at least two of the children were independently searching for evidence for counter-arguments to it. Boy 1 was trying to find out how serious a criminal Robin Hood actually was, which might have a bearing on the level of risk he was running. Girl 2 was also hoping to deal with the criminality/risk objection to being a merry man, by looking for evidence that the merry men were not involved in Robin Hood's crimes. She could then argue that it would be better to be a merry man than a peasant on lifestyle grounds.

This argument exemplifies the way the children dealt with the topic throughout the three sessions, i.e. rapidly and flexibly, partly collaboratively but partly independently. We were surprised that these 11-year-olds apparently did not have difficulty in generating or following quite complex logical arguments about a topic they had been investigating, and did not need to make this logic explicit to pursue their research. There seemed to be no need from the children's point of view to slow down their process, or to try to capture the structure of the various arguments in a tangible notation.

On the other hand, at the end of the children's second session, we learned something about the kind of help they did seem to need. By that stage, the group was committed to arguing that they would prefer to be merry men than to be peasants. They were keen to have a debate against another team who would argue the opposite viewpoint. The facilitator then challenged them to explain how they would deal with counter-evidence to the view they had decided to adopt. The group struggled to answer this question. They acknowledged that they would need to do something constructive with the counter-evidence. However they could not give any coherent account of how they would deal with it.

Thus while the children had found it relatively easy to develop and understand logical arguments within their own small group, they did not know how to present their arguments both informatively and persuasively to an outside audience i.e. to create a rhetorical argument. These observations led us to examine further the possibilities of using a TUI as a means of supporting rhetorical argumentation and persuasion.

ITERATIVE DESIGN

Following our observations of children's argumentation process, we embarked upon a course of iterative user-centred design. Our prototypes progressed from low-tech paper prototypes, through low-tech 3D prototypes and the introduction of a 'Wizard of Oz' [9] GUI to fully functioning prototypes, using both GUI and TUI. We gained new insights at each iteration, both about the design and technical requirements of tangible user interfaces and the application area of teaching rhetoric. In the following section we discuss some of the iterations and what we learned from them.

3-D Low-tech, Large-scale

For several reasons, we became interested in creating a large-scale version of our game, to be played over a large floor area rather than on a table top. Stanton et al [15] have pointed out that designing large artefacts encourages collaboration for three reasons: they slow down the pace of interaction, giving other participants more of a chance to react and intervene; larger interfaces are more legible; and bigger interfaces require more effort to manipulate, encouraging participants to help each other.

In addition to noting this advice, we made an information-gathering visit to the Science Museum in London, where we observed children interacting with a variety of exhibits. Many of the main exhibitions relied on interactive screens, duplicated at adult- and child-appropriate heights. However, these were noticeably less popular and engaging for children than the large-scale tangible objects (e.g. Archimedes screw, pulleys and levers) in the 'Launch Pad' gallery [11].

This resulted in the first version of the prototype that we evaluated, which consisted of large brightly coloured boxes, each of which had a statement resulting from the children's research printed on it. These boxes were stacked on the argument squares running diagonally along the floor. This diagonal arrangement permitted children to walk naturally along the path of the argument as they delivered their speech.

We found that when children stacked the boxes they tended to put the most obvious or important point on the argument square first and then stacked the other boxes on top of it. The children then gave their speeches by starting with the statement at the *top* of the stack and moving *downwards*. Thus, when presenting, they automatically reversed the order of the points they had arranged in the stack, making the most obvious point last. A concern was expressed by our teaching colleagues that our interface appeared to be dictating an order to the evidence which the children had not intended. We also discovered that storage and transportation of many large objects was disruptive to classroom organisation.

Adding RFID Capability

Once we had had an opportunity to see how the children responded to the activity as a whole, we wanted to see how adding RFID tags would affect it. Our first attempt to introduce 'real' technology, an RFID-enabled version of the large coloured boxes, seriously hampered the children's interactions with the system. This was because the type of RFID technology that we introduced would only allow one RFID tag to be read at a time by an RID-reading antenna. This created a two-step process, in which the children had to place each statement box on a reader target and then move it out of the way so that another statement could be added. As a result, the children attached little significance to the positioning of the boxes after they had 'checked in' the statement boxes on the reader. Hence when they came to deliver a speech, their material was far less well organized than we had seen in earlier trials.

Because we had observations from previous low-tech design sessions to compare to early evaluations of the RFID technology, we were able to see that these problems were caused by an unsuitable RFID technology which dictated a particular style of interaction. We were therefore in a strong position to search for an RFID implementation which allowed the positive interaction style we had seen with earlier low-tech prototypes.

Development of the GUI

Our early designs for the GUI to accompany the TUI tried to show the text of each argument square and the text of each of the statements, together with positioning of the statements on an argument square. This proved very difficult and could only be done by making the text on the statements very small. This resulted in a second iteration of GUI design in which the detail of the argument was shown on several screens.

EVALUATION SESSIONS

We conducted evaluations of the most recent table-top version of the Webkit application (described above) with two groups of six to eight children. Evaluation for each group consisted of three separate hour-long sessions.

Using the GUI and TUI Together

Children were enthusiastic about the application from the moment that they entered the classroom. They required little instruction from the facilitator as to how to use the TUI and GUI in concert, and together the group discovered all of the functionality of the TUI and GUI by exploration. The children were observed using the overview screen of the GUI in combination with the TUI. They used the equipment successfully to help them decide which sections of the argument were inadequately supported by evidence, and still required further statements. Overall, the lesson plan and learning goals were completed successfully during the session.

GUI Conventions and Expectations

Observation of the children's use of the TUI and GUI did reveal some evidence of confounded expectations transferred from their knowledge and use of existing interfaces. For example, the Webkit GUI was projected onto a touch-sensitive whiteboard which the children had used in previous lessons. One child tried touching a thumbnail of a webpage which could be seen in the second screen. When he was asked why he did this, he said he thought he would be able to see the web page by touching the icon.

As described above, putting one of the statement cards on the magnifying glass reader resulted in a screen which showed the web page on which that statement was based. However, since the GUI offered no mouse or keyboard there was no way for children to interact with the page. Several children expressed a desire to scroll down the source web pages and some also wanted to follow links in the web pages to other pages that they had previously seen in the course of their research.

We had not anticipated the effects of existing GUI conventions on children's expectations, because of our design focus on a tangible alternative: putting a statement card on the magnifying glass reader. We think this is an important lesson for TUI design; no matter how novel or intuitive a tangible interface might be, many users will resort to a familiar convention, in this case 'clicking' on thumbnails, following navigation links and all the other behaviour expected of a web page.

Multiple Displays

We realized during the evaluation that it was problematic to use a single display to show the overview screen, the detailed screen and the webpage/research screen. Although there was no conflict between the overview screen and the detailed screen, the research screen needed to be visible separately, both during the arrangement of material and the speech delivery phase. Furthermore, when children were asked to give a speech based on their layout of information, several of them wanted to illustrate a particular point by showing an image that they had seen during their research. We aim to address these issues in future versions.

Supporting Speech-Making

It also emerged that the screen and TUI arrangement was not ideal for giving a speech. Children had to face in the wrong direction, i.e. not facing their audience, both to read the statements from the TUIs and to look at the GUI. Some work has been done on the arrangement of multiple GUI displays for collaborative working [5] and we took this work into account when designing the layout of our GUI and TUI. However observations from our trials indicate that optimum layout is to some degree task-specific. The size and location of the TUI also influences which layout works best: in earlier trials with a floor-top TUI, the children had been able to stand to the side of the screen facing their audience and read easily from both the GUI and floor-based TUI, so these particular problems had not emerged.

Gender and Interaction Style

Gender differences emerged throughout the trials. We had hoped that the accessible and distributed nature of the TUI would encourage *all* the children to learn how to use it, avoiding a situation where some children dominated its use, excluding others. We succeeded in making the technology accessible to several children at once, and we did not observe any competition or conflict over its use. However we observed that the boys nonetheless showed much greater interest than the girls in playing with the TUI and understanding how it related to the GUI. Interestingly, this was not because the boys were dominating the activity as a whole. On the contrary, in all our trials, one or two girls in each group tended to adopt the informal role of 'team leader' for the discursive tasks, and showed no hesitation in organizing and directing the other children, including the boys, towards the creation and presentation of the group's final speech. Thus, the boys' enthusiasm for the technology perhaps gave them a way into the activity on more equal terms with the girls. Gender differences aside, we consider that an advantage of the Webkit application is that it can provide a role in the rhetorical process for less articulate as well as more confident and talkative children.

FURTHER WORK

Argument Visualization

Further work is needed on how best to use the GUI to capture the richness of expression afforded by the TUI. This depends on improving our understanding of the way the children make use of the interactions between the TUI and the GUI. We are also keen to explore ways of encouraging greater collaboration between children of differing abilities and cognitive styles, and thus a more integrated group approach to the use of the application to support their arguments.

A Floor-Top TUI

In their paper describing a TUI for storytelling, Stanton et al suggest that size may be a factor in the degree to which a TUI supports collaboration [15]. Constraints of the RFID-sensing technologies and the practicalities of moving and storing thirty large cardboard boxes led us to settle on a table-top solution for the application we describe here. However, we believe that a larger floor-based embodiment of our TUI would be worthy of further consideration.

A Paperless TUI

Our application uses printed paper for the text of the argument squares, and for the text of the statements which are placed on each square to create an argument structure. We have relied on printed text because of its superiority over any other display method for legibility [14]. However, if the display of text on the argument squares and the statement holders were electronic rather than printed, and hence instantly reconfigurable, the flexibility of our system would clearly be greatly enhanced [19]. In future prototypes, we intend to explore ways of replacing printed text with electronic displays without a reduction in legibility.

Not Just Kids' Stuff?

There has been interest in Webkit from groups of adult potential users. However, in real-life situations the connection between rhetorical structures is much more fluid than the rigid training structures provided by the progymnasmata [8]. Taking this into account, we hope to explore ways of adapting our application to support adult collaborative argumentation in a variety of contexts.

CONCLUSIONS

The Webkit application supports the learning of vital rhetorical skills by combining a tangible and graphical user interface in a novel way. Children using the application are aided in three ways: firstly, in the organization of material into a structured argument, secondly, in recognizing where further evidence for the argument is required, and finally in the transformation of structured material into prose.

The TUI allows several children to interact with the application at once, preventing one child from dominating the use of the technology as typically happens with traditional PCs. It also allows less articulate children to become involved in a process that otherwise might leave them silent and sidelined.

Webkit bridges a gap we have identified between story-telling applications for children and applications which facilitate the expression of complex arguments by adults. We believe it is an important contribution to computer support for the teaching and practice of rhetorical skills.

ACKNOWLEDGMENTS

Thanks to Chris Vernall at CRL for his assistance in creating prototypes; Kate McCluskey for initial ethnography, Amanda Simpson and Dave Pratt for their educational research perspective and William Newman for his comments on an earlier version of this paper. This research is funded by European Union grant IST-2001-34171. This paper does not represent the opinion of the EC, which is not responsible for any use of this data.

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