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Article

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Abstract. Two research projects in the IDEAs Lab at the University of Sussex are exploring the development of metacognitive software scaffolding. The Ecolab software encourages learners to improve their help seeking and task selection skills, and through this their performance at the domain level of Ecology. The Riddles project uses word ambiguity in joking riddles to scaffold children's reading comprehension. Participants in this session will try out the two pieces of software: Ecolab and Riddles, watch video recordings of children's interactions with each and contribute to a discussion about the learner modelling implications of developing scaffolding at this meta level.

1 Background and International Context

The concept of software scaffolding is grounded in Vygotsky's Zone of Proximal Development [4, 5]. It represents an extension to the face to face scaffolding pedagogy developed by Wood, Bruner, & Ross [6] and has been successfully employed within the design of educational technology to help bridge the recognition-production gap between what learners want to achieve and what they are able to effect themselves without assistance. Successful scaffolding requires collaboration or assistance for a learner or group of learners from other more able partners who must provide appropriately challenging activities and the right quantity and quality of assistance. The more able partner may take the form of another person, but in the case of software scaffolding the more able partner can be created within the software. Whatever the nature of the learning partner, the key factor at the heart of effective scaffolding is not only the ability of the more able partner to offer appropriate help, but also their ability to withdraw or fade the support they offer when the learner is ready. The implication of this for those playing the role of the more able partner is that they need to have a good model of how well the learner is doing in order to both provide and withdraw assistance appropriately.

Considerable success has been achieved in the development of software scaffolding (see for example [1] at the domain level with less attention to the potential for providing explicit support at the metacognitive level. Two research projects currently underway within the IDEAs Lab at the University of Sussex are exploring the ways in which software may be able to scaffold learners at this metacognitive level:

2 The Ecolab

The Ecolab software [2, 3] also implements scaffolding for learners at the domain level. This software provides 10 –11 year old children with the facilities to model feeding relationships in a simulated ecology laboratory environment. This environment can be viewed from several different perspectives, including: *World* - a picture of a woodland environment and the organisms the child has chosen to place within it; *Web* - a traditional textbook style diagram of the organisms in a food chain or food web; *Energy* - a graphical representation of the energy levels of the organisms currently 'alive' in the Ecolab. The complexity of the relationships represented within the Ecolab can be varied at any stage during the child's interaction with it. In addition to this simulated laboratory environment, the system offers each learner a collaborative learning partner to provide assistance. This assistance moves beyond support for children's learning about feeding relationships within food chains and webs and can assist a learner to take more control for her own extension. The system models a learner's developing collaborative skills as well as her developing understanding of the curriculum. In particular the current version of the Ecolab encourages learners to improve their help seeking and task selection skills, and through this their performance at the domain level.

3 Riddles

Our second example project is exploring Metalinguistic scaffolding to support young readers text comprehension. Poor text comprehension in children of 7-11 years old is a matter for concern recognised by teachers. Some children (`poor comprehenders') learn to decode accurately but then fail to progress in their ability to understand what they read. Inability to comprehend what is read can reduce children's motivation to read, and hence can affect their subsequent reading development. Three deficits in poor comprehenders have been identified: working memory, inferential skill and language awareness, i.e. the ability to treat language as an object and to reflect on its structural features such as phonology and syntax. Language awareness is particularly amenable to training and was assessed in more detail by Yuill [8]. She demonstrated a relation between comprehension skill and language awareness, assessed through children's understanding of riddles based on different types of language ambiguity. For example:

Question: Why did the leopard never escape from the zoo?
Answer: Because it was always spotted.

Understanding why this joke is funny rests on the children's metalinguistic skill: their ability to disambiguate the word "spotted". Poor comprehenders did not understand this dual interpretation and failed to `get the joke', although they could understand jokes without such linguistic ambiguity. The study suggested that riddle disambiguation could play a useful role in developing comprehension skill. This lead to the development of a software system called Joke City [8]. This presented riddles to pairs of children and invited them to discuss different interpretations in order to `get the joke'. Pilot work showed that children's reading comprehension scores (as measured by The Neale Analysis of reading ability 1989) improved after interaction with the software.

4. The interactive event

The event will have three main sections: introduction, hands-on, video data presentation and discussion.

Introduction

In this phase we will describe very briefly the underlying rationale to the software scaffolding work at Sussex. We will outline the objectives of both the Ecolab and Riddles software and explain the current versions of software available for the hands-on session.

Hands-on

Participants will be asked to complete one of the activities provided within each of the Ecolab and the Riddles software. Participants will be asked to consider two issues in particular at specific stages in their interactions. These will be used to focus the discussion at the end of the session.
With the Ecolab – what information is the system modeling in order to adapt the advice it offers to them as they complete the activities?
With the Riddles – what opportunities are there for children working in pairs to scaffold each other as they collaborate to understanding the ambiguities within the riddles presented to them?

Video data presentation

In this phase we will show very brief clips of children using the software to complete the same tasks required of the participants. The purpose of this section of the event will be to allow participants to consider their own experiences with the software and their exploration to the two issues posed to them.

5. Related contribution to AIED '03

The subject of scaffolding is central to the conference paper: "Out of the Box, but in the Zone? Can digital toy technology provide a more able peer for young learners?" by Rosemary Luckin, Daniel Connolly, Lydia Plowman, and Sharon Airey.

6. References

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