Scaffolding in Innovative Learning Arrangements with an Embodied Agent supported by an Attention Management System.

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**Background**

Innovative learning arrangements are characterised by a constructive learning task in a situated environment in which students work collaboratively (Simons, 2000). These environments draw largely on the regulative capacities of students allowing a high control over the learning process and learning content. Many students are unable to successfully sustain in these environments, due to a lack of self-regulative learning skills.

Research findings indicate that scaffolding of self-regulative learning can support learners to successfully sustain in these environments (Azevodo & Hadwin, 2005). Fixed scaffolding is defined once and it is the same for all students. Adaptive scaffolding provides support to learning in an individualised manner, entailing diagnosing, calibration, and fading as the learners’ abilities and confidence increase.

Whilst fixed scaffolding appears to produce mixed results, adaptive scaffolding has been shown to support several aspects of students learning (Chi et al, 2001, 2004, Alevsen & Koodinger, 2002).

**Research questions**

How does dynamic and adaptive scaffolding enhance self-regulative learning in innovative learning arrangements?

- **System design questions**: What is the appropriate interventions at which time and how should it be communicated to the learner?

- **Effect questions**: What is the effect of the scaffolding of self-regulated learning on the meta cognitive and cognitive activities, motivation, and epistemological beliefs of the learners and the learning outcomes?

**System design**

Attention management systems components:

- ASKME, an user tracking tool
- Attention-aware system reasoning module
- Ontdeknet, e-learning application
- Embodied agent module

**Event model**:

- Application events
- Environmental tracking events
- User events

**Intervention Model**:

- Cognitive interventions
- Meta cognitive interventions
- Motivational interventions
- Behavioral interventions

**Design studies**

**Case studies**:

What are the intervention types in the intervention model?

12 pupils; aged 8 & 12; 6 hours; 1 school; 3 classes

**Wizard of Oz study**:

How can we connect the event model and the intervention model?

10 experts; aged 25-50; 35 minutes

**Test runs**:

How does the system perform with a representative user load?

89 students; aged 9-12; 1 hour; 3 schools; 4 classes

**Effect studies**

**Study I**: with scaffolding ≠ without scaffolding

What is the effect of dynamic scaffolding in the context of Ontdeknet?

134 pupils; aged 11; 4,5 hours; 5 classes; 4 schools

Preliminary results:

- Experimental group pose more questions to the expert
- Experimental group can rephrase the learning goal better
- Experimental group wrote papers with a higher quality
- Experimental group reports higher motivation

**Study II**: directive ≠ initiating interventions

What is the effect of directive versus initiating scaffolding on self regulated learning?

To be preformed in the fall

**Assessment data**

- Experimental vs. Control
- Questions asked
- Learning goal
- Quality paper

- 90,5% of the students like to work with agent Matthew again
- 95% would like to work with a different agent than Matthew
- 90% found that the agent provided good help
- 62% wants to work with an agent more often

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