Magical Garden

... exemplifying a novel generation of educational software

ETG: The Educational Technology Group, Lund University & Linköping University – in collaboration with AAAlab, Stanford University.

Features

- First teachable agent based software applying the concept of "learning by teaching" to preschoolers.
- Targets conceptual foundations for math focusing on number sense.
- Combining individual adaptation with inclusion.
- Based on the dual strategy of a "real world" software as a "research

Learning

Our results from three studies suggest that preschool children (3 to 5 years):

- are not confused or disturbed by the presence of a teachable agent,
- are able keep their attention towards their TA when exposed to distractions,
- exhibit quite a mature understanding of a TA as a social entity.

Magical Garden seems to provide: (i) motivational scaffolding for preschool children, and (ii) cognitive scaffolding (e.g. scaffolding for "teaching behavior").



instrument" (Explore & Support).

Teachable Agents

A student teacher (a real student taking the role of a teacher) training a *digital tutee* (a computer program acting as a tutee).



Number Sense & Early Math

Educational initiatives to strengthen elementary school math are increasing – but for many children this may come too late.

Adaptation & Inclusion

Individual adaptation is combined with an inclusive pedagogical approach.

Individual Adaptation: Each child is challenged on her individual level based on continuous evaluations of previous accomplishments.

Inclusion: Game scenes are randomly chosen and all children are rewarded (on their level of difficulty) with water drops to have their magical garden grow. In this sense all children play the same game and comparisons are non-trivial.



Brain (and learning)

A next step is to use the Magical Garden platform in long term intervention studies. Measurements will combine:

- neurocognitive measures (event-related potentials, ERPs),
- proficiency measures (behavioral tests),
- information gained from game logs. _____

We expect to find changes in the ERP effects that are not captured in the behavioral measures, i.e. changes that reflect pre-learning.

We also anticipate this material to shed light on the mechanisms behind "therapy resistance" (i.e., children who do not respond as expected to an intervention).

The Magical Garden project focuses on preschool/Kindergarten – a period when children establish fundamental precursors to future math understanding, in particular number sense. With Magical Garden we target:

- Getting Started: To stimulate and support children at risk of falling behind.
- **Catching Up:** To identify children who may have special needs, for example support of special educators.



Explore & Support

Magical Garden is both a real world educational game and a research instrument to study dynamic learning. Magical Garden enables:

- controlled manipulation of variables,
- coming close to learning processes, ____
- large scale logging of game events, ____
- access to children's spontaneous reason-ing about game events.





Culture (and learning)

In cross-cultural studies (Sweden, Finland, US) with educational software we also explore "pedagogical cultural differences".

- Pedagogical ideologies: different ideas about what kinds of preparation for school are adequate in preschool/ Kindergarten (and not adequate).
- Cultures of learn-



Poster design & graphics: Magnus Haake & Sebastian Gulz-Haake (2014)



ing: different conceptions and practices with respect to individualized learning, corrective feedback, collaboration, and competition.











Thinking in Time: Cognition, Communication & Learning

A Linnaeus program at Lund university

