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The Role of Teachers' Strategies in Stimulating Curious Minds

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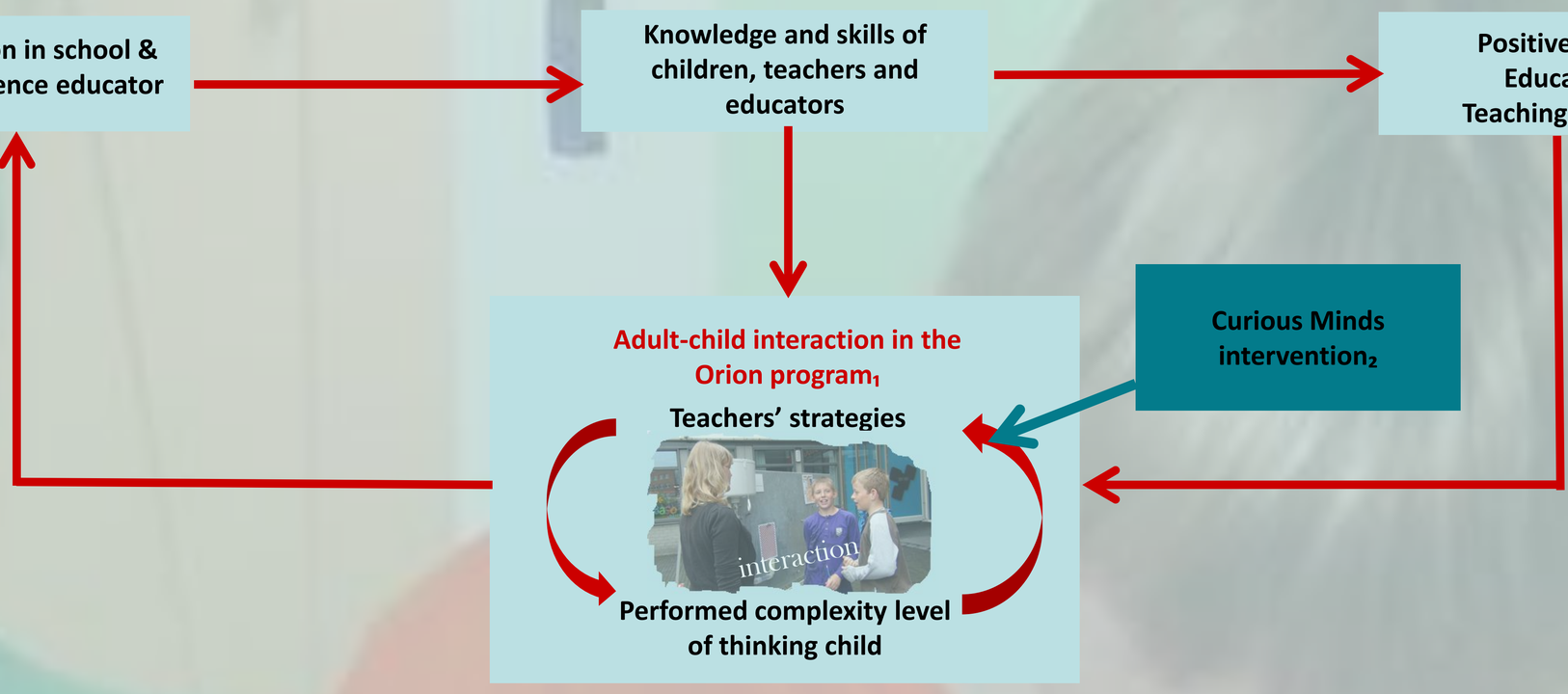
Conceptual framework



1Orion Program: This program provides stimulating science and technology environments for children
2Curious Minds (CM): Short training for teachers (in this case Orion Educators) in CM principles and teaching strategies in order to evoke and develop S&T talents of children
Red arrows represent a cyclical process, blue-green arrow represents potential effect of the CM intervention

Background theory

1) We base our model of action and thinking of children on the skill theory of Fischer & Bidell (2006). This theory distinguishes several levels of complexity.
2) In the teaching process it is essential to give children the opportunity to construct their own thinking (Chin, 2007). The best way to do so is by using a pupil-centered approach (Oliveira, 2010).
3) Micro genetically, the teacher and the child can be conceived of as being engaged in a mutual process (Van Geert & Steenbeek, 2012). By observing these micro-processes we can see if the teachers' strategies and children's level of complexity form a coherent pattern over time.

Research questions:

1) How do teachers' strategies change after intervention of Curious Minds?
2) How do teachers' strategies relate to the children's performance of complexity level of thinking?

Design

A case study approach with

1) A pre-measurement by means of process observation of the strategies of two motivated educators and the children's performance of complexity level of thinking.
2) Curious Minds intervention.
3) A post –measurement by means of process observation of the educators' strategies and children's performance of complexity level of reasoning .

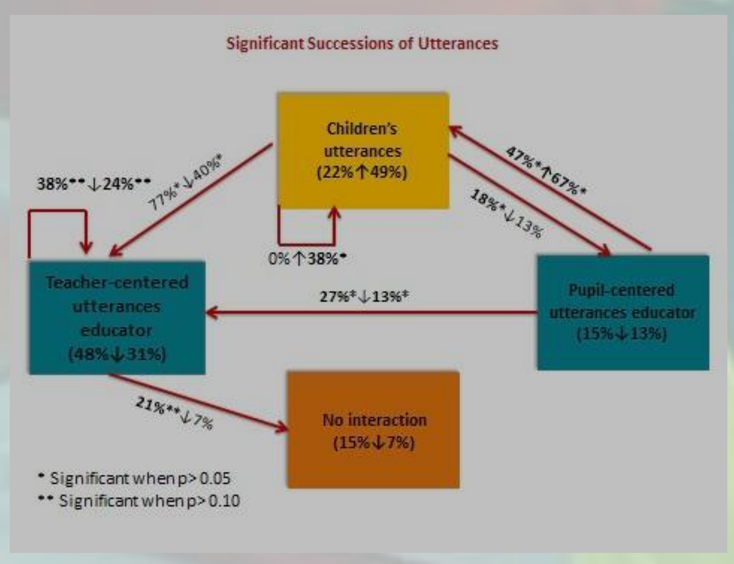
First results Curious Minds intervention

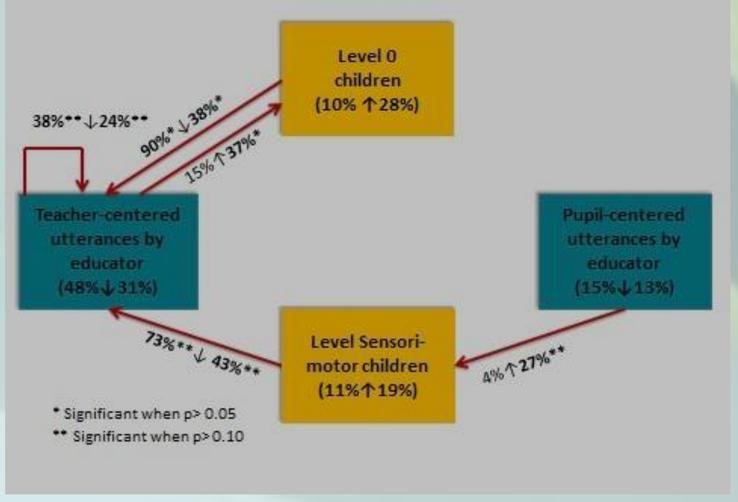
	Before CM intervention	After CM intervention
% Utterances Teachers	42%(M) 60% (W)3	50%(M) 32%(W) 3
% Utterances Child	48% (M) 25% (W) 3	38%(M) 63% (W) 3
% frequency no interaction	9%(M) 15% (W) 3	12% (M) 3% (W) 3

	Before CM intervention	After CM intervention
% Teacher-centered utterances	64% (M) 76% (W) 3	67% (M) 65%(W) 3
% Pupil-centered utterances	36% (M) 24% (W) 3	33% (M) 35% (W) 3

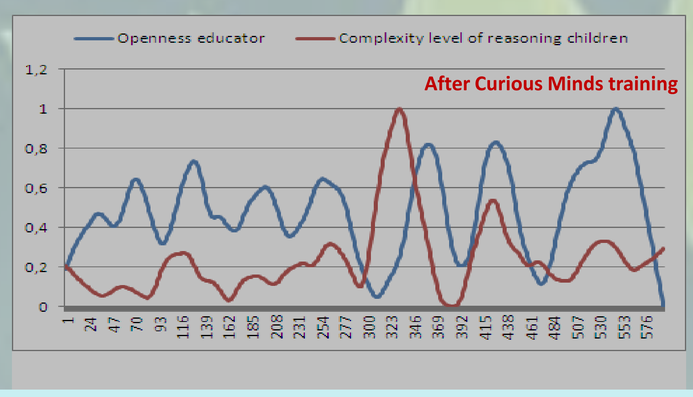
	Before CM intervention	After CM intervention
% utterances on level 04	63% (M) 46% (W) 3	48% (M) 72% (W) 3
% utterances on sensorimotor level	25%(M) 50%(W) 3	26%(M) 25%(W) 3
% utterances on representation level	13% (M) 4% (W) 3	26%(M) 3% (W) 3
% utterances on abstraction level	0% (M) 0% (W) 3	0% (M) 0% (W) 3

Blue: positive result
Red: negative result
3 Prototypical teacher
4 Level 0: zero complexity (non scalable)





Results Prototype 3



We see a slight difference in the use of strategies and the complexity level of thinking in the two conditions. Some results turned out to be negative, like the fact that the female teacher seemed to elicit less utterances on representation level, although her teaching strategy was more pupil-centered than the strategy of the male teacher. When we take a closer look at the female teacher(prototype), we see that in the Curious Minds condition children spoke more to each other and the response of the teacher was less teacher-centered. Pupil-centered utterances were also more often followed by a reaction of the child and the percentage of teacher-centered utterances followed by teacher-centered utterances was lower. The results of the successions regarding the complexity level show that children often reacted with a short answer, like 'yes', 'no' which is being labeled as a level 0 utterance. These reactions were more salient in the CM condition, probably due to the higher number of reactions within the group of children. The results of a teacher-centered approach led in 37% of the time to a non-scalable level 0 in the CM condition. A pupil-centered approach led to a sensorimotor level in 27% of the cases in the CM condition. The response to a sensorimotor level was less likely a teacher-centered reaction in de CM than in a non CM setting. Further research on the short-term time-scale patterns show that in the CM condition the pattern of the teacher's strategy and the level of complexity in thinking seem to be coherent.

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