Symposium 09: Task complexity and task analysis: Neo-Piagetian perspectives on cognitive modelling

🕐 **DATE & TIME**

May 31st at **3:15 PM** until **4:45 PM**

TRACK

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📍 **LOCATION**

UVA3

RATING (VOTES)

Organizers:

- Sergio Morra (Università di Genova) morra@nous.unige.it

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This symposium deals with using theoretical constructs and empirical data to model cognitive complexity of tasks. Paper #1 considers conflictual versus non-conflictual tasks. Cognitive conflict arises when different processes activate incompatible schemes. Modelling non-conflictual tasks only requires to identify task-relevant schemes requiring effortful mental attention. Modelling conflictual tasks also demands consideration of processes that could resolve the conflict. As example of non-conflictual task, we present young volleyball players' motor learning of increasingly complex attack techniques, by coordinating increasing numbers of schemes. Number conservation exemplifies a conflictual task. Here, we predict catastrophic transitions between nonconservation and conservation according to relative strength of cognitive mechanisms activating competing sets of schemes. Paper #2 uses brain correlates of mathematical cognition to discuss a neo-Piagetian model of hemispheric asymmetry, defined by a trade off between task complexity and the individual's mental-attentional capacity. Specifically, children engage only the right hemisphere when processing simple math tasks, whereas mathematical operations that require more effort also engage the left hemisphere. Such findings challenge a classical interpretation, attributing verbal processing to the left hemisphere and visual-spatial processing to the right hemisphere. Paper #3 presents design research

Details

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analyzing data from educational activities. The cognitive task is characterized as a guided negotiation between personal and cultural forms. An embodied-design framework is used to build student experiences that elicit targeted personal resources, such as unarticulated sensorimotor capacity, and complementarily create opportunities for students to accommodate, complexify, and empower these resources through the appropriation of cultural forms. Two projects exemplify perception-based versus action-based genres of embodied design. Both projects used task-based semi-structured clinical interviews followed by micro-analysis of conceptual ontogeny. Paper #4 considers the role of mental attention in development of math reasoning with fractions. Mental attention is needed to boost activation of task-relevant schemes not sufficiently activated by other sources. It grows with age in childhood and is a maturational causal factor underlying working memory. Metasubjective task analysis is a method for estimating task mental-attentional (M-) demand. M-measurement is used to assess participants' mental-attentional capacity. Participants should reliably solve only tasks with M-demand within their M-capacity. We present task analyses to estimate the complexity of different kinds of fraction word problems. We present performance data from children in grades 4-8 to examine the M-demand vs. M-capacity trade-off in fraction problem-solving.

Analyzing the complexity of cognitive tasks with and without cognitive conflicts

- Sergio Morra (Università di Genova) morra@nous.unige.it

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- Roberta Camba (Università di Genova) robertacamba@tiscali.it

A trade off between mental-attentional capacity and task complexity may drive hemispheric asymmetry

- Marie Arsalidou (National Research University Higher School of Economics) marie.arsalidou@gmail.com

Design research as iterated cycles of cognitive-task ideation, implementation, and analysis

- Dor Abrahamson (University of California, Berkeley) dor@berkeley.edu

Mental Attention as a Developmental Factor in Fraction Problem Solving

- Juan Pascual-Leone (York University) juanpl@yorku.ca

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