KATHOLIEKE UNIVERSITEIT LEUVEN

The role of tool and learner variables on using tools

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Introduction

•Opportunities (tools) are not always grasped (Perkins, 1985).

•When they are, often used not as intended (Elen & Clarebout, 2006). Why?

- Learner variables: Cognitive, metacognitive and motivational (e.g. Aleven, Stahl, Schworm, Fischer, & Wallace, 2003).
- Tool variables: tool type, tool functionality (e.g. Clarebout & Elen, 2006).
- TAM model (Davis, Bagozzi & Warshaw, 1989) → *perceptions*

Are tools functional?
Do learners perceive the most functional tool?
Is their selection influence by perceptions or other variables?

Materials and methods

•A psychomotor task: The assembly of a LEGO® figure (fig. 1).

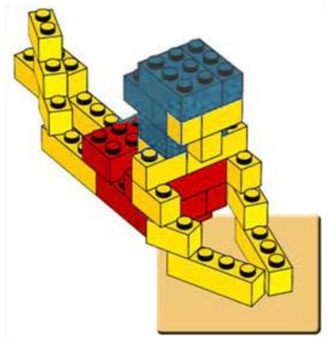

Fig. 1 LEGO® figure

•Two tools: A guideline (fig. 2), and a video (fig. 3).
•Four conditions: guideline (G), video (V) and guideline and video (GV) and a control (C) condition.
•58 students (74% female), 23 years old (*SD*=3.51).
•17 in (G, V and GV) condition and 7 in the (C) condition.
•Three questionnaires: Field dependence-independence, metacognition and self-efficacy.

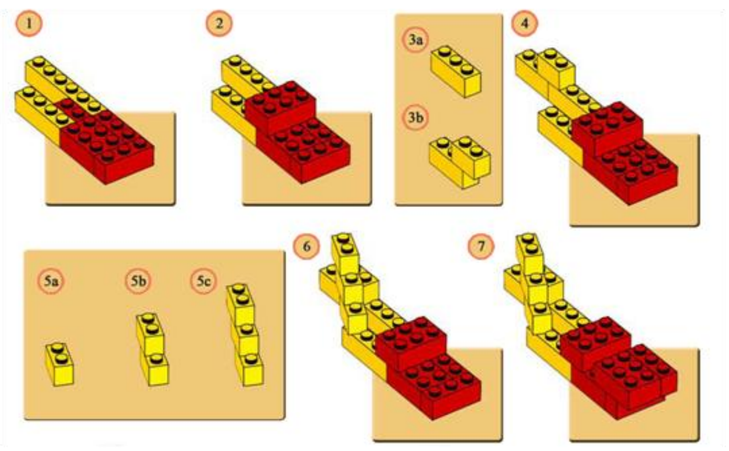

Fig. 2 Sample piece of guideline

Materials and methods cont.

•Session 1: The questionnaires.
•Session 2: Psychomotor task:
Steps
1. LEGO® bricks, tool and instructions.
2. Building figure in 10 minutes.
3. Word puzzle as a distracter.
4. Building figure again: no tool, max. 15 minutes. Pieces placed correctly (performance) (DV).

Fig. 3. Snapshot of video

Results

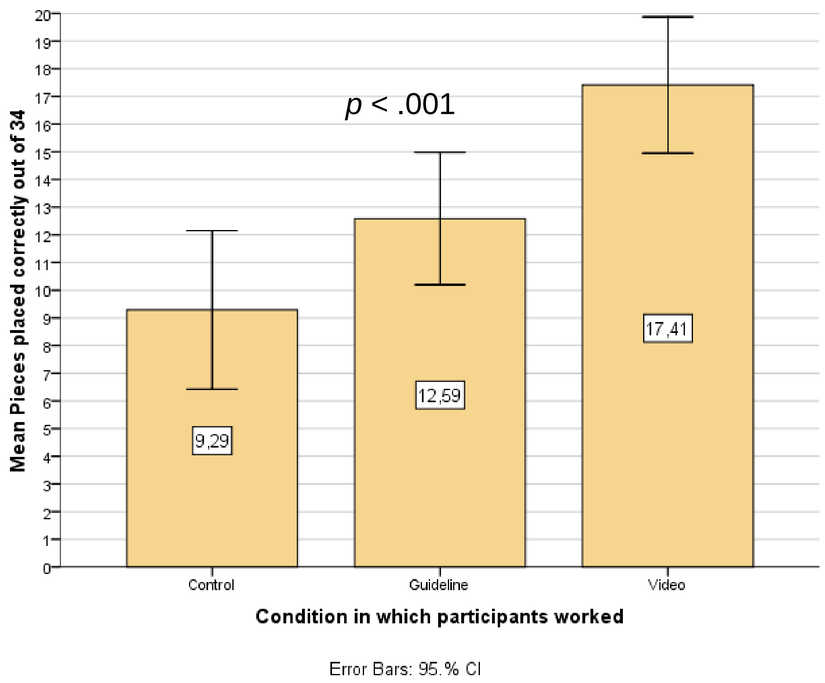

Fig. 4. Tool functionality

Further info?

Juarez-Collazo, N. A., Lust, G., Elen, J., & Clarebout, G. (2011). Tool use in a psychomotor task: The role of tool and learner variables. *International Journal of instruction, 4(2), 139-160.*

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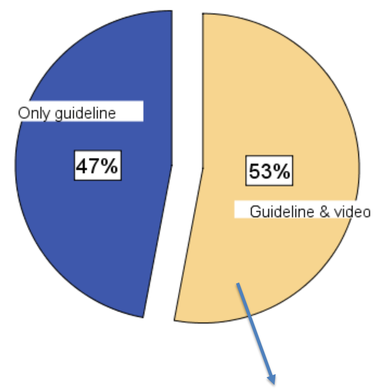
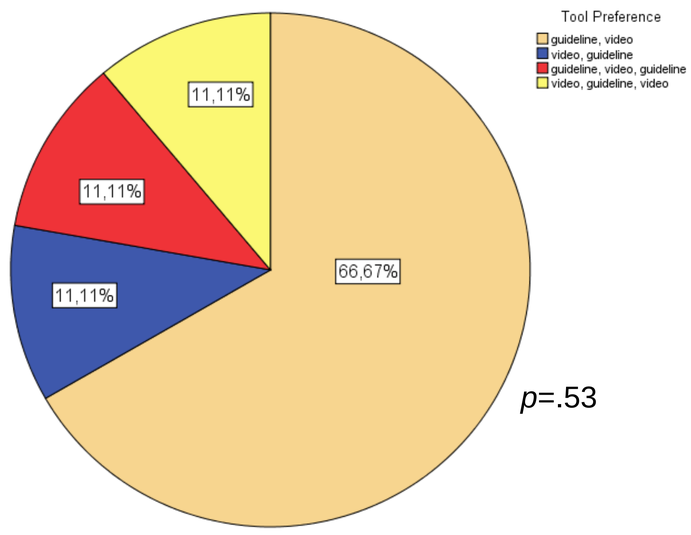
Results cont.





p=.53

Fig. 5. Tool choice and tool preference

•No significant difference between conditions and learner variables ($p > .05$).

Discussion & conclusion

•**Tools are functional** but…
- Mirror neuron system: Dinamic visualizations + efficient for movement tasks (van Gog, Paas, Marcus, Ayres, & Sweller, 2009)

•**Perceived usefulness on GV condition**
- Combined tools (Zydney, 2008, 2010) → Cognitive Load (Aleven, Stahl, Schworm, Fischer & Wallace, 2003)
- Tool design: Design for use vs. design of use (Mackay & Gillespie, 1992)
- Tool familiarity (Iiyoshi & Hannafin, 1998)
- Tool flexibility (Shapiro, 2008).

•**Learner variables**: No difference observed.
- Sample, instruments, duration of task

Further research