

<b>School/Department:</b>	Erasmus School of Social and Behavioural Sciences (ESSB) Department of Psychology, Education, and Child Studies (DPECS)
<b>Project Title:</b>	Empowering Learners: Supporting Transfer and Internalization of a Physical Learning Strategy.
<b>Abstract:</b>	<p>One of the key challenges in contemporary education is to make effective use of external representations to support student learning. To date, there has been much research demonstrating the benefit of enriching the learning process with external visual representations (e.g. pictures) or other forms of external representation (e.g., gesture, physical interaction). Although studies so far indicate that externally representing or interacting with learning material benefits learning and reduces cognitive load, the benefits are usually confined to the just-learned task and there is limited transfer to a novel learning task. In this project, we argue that this is because learners have not been exposed to sufficient practice or training in using the strategy and on how to internalize and flexibly use the taught strategy. The central question in this project therefore focuses on how learners can best be supported to (1) acquire the physical strategy and apply it in a variety of tasks, and (2) move from reliance on external, physical interaction to the use of internal (or mental) processes during learning?</p> <p>The project is based on the premise that it is crucial to teach learners strategies to effectively process learning content and the central aim is to develop the most optimal intervention (set and sequence of activities) to help learners to acquire the strategy and internalize it so that they can perform the learned strategy mentally in absence of external forms of representation. The PhD-candidate will conduct controlled experimental studies within the context of a self-managed learning environment; students are taught a strategy to physically interact with the learning material (learning with external means of representation) and subsequently receive different forms of support (e.g., gradual fading of physical interaction, practicing to mentally manipulate learning content) to help them internalize the strategy that enables them to constructing an internal representation of the content-to-be-learned. Learning performance, cognitive load, and transfer to novel tasks will be measured. Factors that will be studied include the type of training activity (e.g., physical, mental, observing someone else), frequency of practice, complexity of the learning task.</p>

<b>Requirements of candidate:</b>	<p><b>Background:</b> The candidate needs to have a Master in Educational Psychology, Cognitive Psychology, or any other related discipline.</p> <p><b>Master's degree:</b> Yes</p> <p><b>ESSB English requirements:</b> IELTS: 7.5 (min. 6.0 for all subs.); or TOEFL: 100 (min. 20 for all subs.)</p>
<b>Supervisor information:</b>	<p>Prof. dr. Fred Paas &amp; dr. Bjorn de Koning <a href="mailto:Paas@fsw.eur.nl">Paas@fsw.eur.nl</a></p> <p><a href="http://scholar.google.nl/citationsFredPaas">http://scholar.google.nl/citationsFredPaas</a> <a href="http://www.egs3h.eur.nl/people/fred-paas/">http://www.egs3h.eur.nl/people/fred-paas/</a></p> <p>Fred Paas is a Professor of Educational Psychology at Erasmus University Rotterdam in the Netherlands and a Visiting Professorial Fellow at the University of Wollongong in Australia. His main research interest is in using knowledge about the human cognitive and motor system in the design of instruction for learning environments. He has (co-) authored over 200 publications in (S)SCI listed journals, which been cited over 18.000 times.</p>

#### A selection of recent publications from 2017-2018

- Baars, M., Leopold, C., & Paas, F. (2018). Self-explaining steps in problem-solving tasks to improve self-regulation in secondary education. *Journal of Educational Psychology*, 110, 578-595.
- Baars, M., Van Gog, T., De Bruin, A., & Paas, F. (2018). Accuracy of primary school children's immediate and delayed judgments of learning about problem-solving tasks. *Studies in Educational Evaluation*, 58, 51-59.
- Castro-Alonso, J. C., Wong, A., Ayres, P., & Paas, F. (2018). Memorizing symbols from static and dynamic presentations: Don't overplay the hand. *Computers & Education*, 116, 1-13.
- Chen, O., Castro-Alonso, J. C., Paas, F., & Sweller, J. (2018). Extending cognitive load theory to incorporate working memory resource depletion: Evidence from the spacing effect. *Educational Psychology Review*, 30, 483-501.
- Chen, O., Castro-Alonso, J. C., Paas, F., & Sweller, J. (2018). Undesirable difficulty effects in the learning of high-element interactivity materials. *Frontiers in Psychology*, 9:1483.
- Eielts, C., Pouw, W., Ouwehand, K., Van Gog, T., Zwaan, R., & paas, F. (in press). Co-thought gesturing supports more complex problem solving in subjects with lower visual working-memory capacity. *Psychological Research*.
- Hoogerheide, V., Renkl, A., Fiorella, L., Paas, F., & Van Gog, T. (in press). Enhancing example-based learning: Teaching on video increases arousal and improves retention and transfer test performance. *Journal of Educational Psychology*.
- Hoogerheide, V., Vink, V., Finn, B., Raes, A. K., & Paas, F. (2018). How to bring the news... peak-end effects in children's affective responses to peer assessments of their social behavior. *Cognition and Emotion*, 32, 1114-1121.
- Kamermans, K. L., Pouw, W. T. J. L., Mast, F. W., & Paas, F. (in press). Reinterpretation in visual imagery is possible without visual cues: A validation of previous research. *Psychological Research*.

- Khalil, M., Wong, J., de Koning, B. B., Ebner, M., & Paas, F. (2018). Gamification in MOOCs: A Review of the State of the Art. In *proceedings of the 2018 IEEE Global Engineering Education Conference* (pp. 1635-1644). Santa Cruz de Tenerife, Canary Islands, Spain.
- Liu, T. C., Chang, C., & Paas, F. (2018). Cognitive resources allocation in computer-mediated dictionary assisted learning: From word meaning to inferential comprehension. *Computers & Education*, 127, 113-129.
- Liu, T. C., Lin, Y. C., Gao, Y., & Paas, F. (in press). The modality effect in a mobile learning environment: Learning from spoken text and real objects. *British Journal of Educational Technology*.
- Mavilidi, M., Okely, A. D., Chandler, P., Domazet, S. L., & Paas, F. (2018). Immediate and delayed effects of integrating physical activity into preschool children's learning of numeracy skills. *Journal of Experimental Child Psychology*, 166, 502-519.
- Pouw, W., Van Gog, T., Zwaan, R., Agostinho, S., & Paas, F. (2018). Co-thought gestures in children's mental problem solving: Prevalence and effects on subsequent performance. *Applied Cognitive Psychology*, 32, 66-80.
- Raaijmakers, S. F., Baars, M., Schaap, L., Paas, F., Van Merriënboer, J. J. G., & Van Gog, T. (2018). Training self-regulated learning skills with video modeling examples: Do task-selection skills transfer? *Instructional Science*, 46, 273-290.
- Raaijmakers, S. F., Baars, M., Paas, F., Van Merriënboer, J. J. G., & Van Gog, T. (2018). Training self-assessment and task-selection skills to foster self-regulated learning: Do trained skills transfer across domains? *Applied Cognitive Psychology*, 32, 270-277.
- Raaijmakers, S. F., Baars, M., Schaap, L., Paas, F., Van Merriënboer, J. J. G., & Van Gog, T. (in press). Improving self-assessments with self-assessment feedback: Effects on subsequent self-assessment and task-selection accuracy. *Metacognition and Learning*.
- Rop, G., Pouw, W. T. L. J., De Koning, B. B., & Paas, F. (in press). The cognitive basis of the split-attention effect. *Journal of Experimental Psychology: General*.
- van der Zee, T., Davis, D., Saab, N., Giesbers, B., Ginn, J., van der Sluis, F., Paas, F., & Admiraal, W. (2018, March). Evaluating retrieval practice in a MOOC: how writing and reading summaries of videos affects student learning. In *Proceedings of the 8th International Conference on Learning Analytics and Knowledge* (pp. 216-225). ACM.
- Wong, J., Baars, M., Davis, D., Van der Zee, T., Houben, G. J., & Paas, F. (in press). Supporting self-regulated learning in online learning environments and MOOCs: A systematic review. *International Journal of Human-Computer Interaction*.
- Wong, M., Castro-Alonso, J. C., Ayres, P., & Paas, F. (in press). Be mindful of the gender gap in animation research: A reconsideration of spatial measurement. *Computers in Human Behavior*.
- Baars, M., Van Gog, T., De Bruin, A., & Paas, F. (2017). Effects of problem solving after worked example study on secondary school children's monitoring accuracy. *Educational Psychology*, 7, 810-834.
- Baars, M., Wijnia, L., & Paas, F. (2017). The Influence of affect and motivation on learning to solve problems in a self-regulated way. *Frontiers in Psychology*, 8:1346.
- Bokosmaty, S., Mavilidi, M., & Paas, F. (2017). Making versus observing manipulations of geometric properties of triangles to learn geometry using dynamic geometry software. *Computers & Education*, 113, 313-326.
- Castro-Alonso, J. C., Ayres, P., & Paas, F. (2017). Computerized and adaptable tests to measure visuospatial abilities in STEM students. In T. Andre (Ed.), *Advances in human factors in training, education, and learning sciences* (pp. 337-349). Springer.
- Lin, P. H., Liu, T. Z., & Paas, F. (2017). Effects of spell checkers on English as a second language students' incidental spelling learning: A cognitive load perspective. *Reading and Writing*, 30, 1501-1525.
- Mavilidi, M., Okely, A. D., Chandler, P., & Paas, F. (2017). Effects of integrating physical activity into a science lesson on preschool children's learning and enjoyment. *Applied Cognitive Psychology*, 31, 281-290.
- Pouw, W., Aslanidou, A., Kamermans, K., & Paas, F. (2017). Is ambiguity detection in haptic imagery possible? Evidence for enactive imaginings. In G. Gunzelmann, A. Howes, T. Ten Brink, & E. J. Davelaar (Eds.), *Proceedings of the 39th Annual Conference of the Cognitive Science Society* (pp. 2925-2930). Austin, TX: Cognitive Science Society.
- Pouw, W., Van Gog, T., Zwaan, R., & Paas, F. (2017). Are gesture and speech mismatches produced by an integrated gesture-speech system? A more dynamically embodied perspective is needed for understanding gesture-related learning. *Behavioral and Brain Sciences*, 40. doi:10.1017/S0140525X15003039



**Erasmus University Rotterdam, the Netherlands**

**CSC PhD 2019 Project Description**

**Applying for CSC Scholarship: <https://www.eur.nl/en/prospective-csc-phd-candidates>**

- Raaijmakers, S. F., Baars, M., Schaap, L., Paas, F., & Van Gog, T. (2017). Effects of performance feedback valence on perceptions of invested mental effort. *Learning and Instruction*, 51, 36-46.
- Ruiter, M., Loyens, S., & Paas, F. (2017). The effects of cycling on a desk bike on attention, retention, and mood during a video lecture. *Applied Cognitive Psychology*, 31, 593-603.
- Sithole, S. T. M., Chandler, P., Abeysekera, I., & Paas, F. (2017). Benefits of guided self-management of attention on learning accounting. *Journal of Educational Psychology*, 109, 220-232.
- Sweller, J., & Paas, F. (2017). Should self-regulated learning be integrated with cognitive load theory? A commentary. *Learning and Instruction*, 51, 85-89.
- Van der Zee, T., Saab, N., Admiraal, W., Giesbers, B., & Paas, F. (2017). Effects of subtitles, complexity, and language proficiency on learning from online education videos. *Journal of Media Psychology: Theory, Methods, and Applications*, 29, 18-30.