

<i>School/Department:</i>	<i>Department of Psychology, Education & Child Studies Erasmus School of Social and Behavioural Sciences</i>
<i>Project Title:</i>	Is Your Brain Monitoring Your Learning?
<i>Abstract:</i>	<p>Think back to the last time you were preparing for an exam. While reading a textbook, you might have asked yourself: ‘Is this making sense? Did I understand what I just read?’. You were self-monitoring (i.e., evaluating) your own learning/performance. You might have also decided to apply some strategies, such as asking yourself questions to make sure you knew the material you have been studying. In other words, you were self-regulating (i.e., controlling) your learning. Self-monitoring and self-regulation are key components of self-regulated learning (SRL) which is related to academic achievement. Surprisingly, students’ self-monitoring accuracy is quite low, regulation of study behavior suffers as well and consequently, SRL often leads to suboptimal learning outcomes. Much, however, remains debated with all possible aspects as to why self-monitoring fails. One possibility is that people do monitor their learning, but they are just not able to accurately judge whether they will remember the learned material. Generally, it appears that people are notoriously bad in self-monitoring and judging their learning. The way forward is to get a better understanding of the underlying mechanisms of this phenomenon. One possible way to pinpoint these mechanisms is to record brain activity while people perform a monitoring task in which they assess how well they have learned given information (i.e., make Judgments of Learning (JOLs)). Using measurements of brain activity can help us separate different aspects of learning, such as attention and memory, involved in making self-monitoring judgments that cannot be understood by looking at accuracy alone. Therefore, in this project, monitoring will be investigated using Event Related Potentials (ERPs).</p> <p>While we are open about the specific research questions the PhD candidate is interested in working on. We particularly welcome those who would like to address (some of) the following questions concerning monitoring:</p> <ol style="list-style-type: none"> 1) What are the reasons (e.g., laps of attention) for poor monitoring during learning or problem-solving? 2) Is there a difference between monitoring a word-learning task and problem-solving task? <p>Supervision</p>

	<p>The project will be located at the Erasmus University Rotterdam (EUR) Rotterdam. Successful candidate will be at the EUR under the supervision of Dr. Lesya Ganushchak (EUR), Dr. Martine Baars (EUR), and Dr. Kalinka Timmer (Jagiellonian University (UJ), Kraków, Poland). Prof. Dr. Fred Paas (EUR) will be promotor for this project.</p>
<p>Requirements of candidate:</p>	<p>Background: Educational sciences, educational psychology, cognitive psychology or similar domains; skilled in quantitative research methods, academic writing, SPSS and/or R statistical software packages, programming skills (e.g. python)</p> <p>Master's degree: Yes</p> <p>EUR requirement: IELTS: 7.5 (min. 6.0 for all subs.) Or TOEFL: 100 (min. 20 for all subs.)</p>
<p>Supervisor information:</p>	<p>Promotor <i>Prof. Dr. Fred Paas</i> <i>Email address: paas@essb.eur.nl</i> 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 complex learning environments. He has (co-) authored over 300 publications in (S)SCI listed journals, which been cited over 36.000 times. https://www.eur.nl/people/fred-paas</p> <p><i>Selected publications</i></p> <ol style="list-style-type: none"> 1. Ayres, P., Castro-Alonso, J. C., Wong, M., Marcus, N., & Paas, F. (2020). Factors that impact on the effectiveness of instructional animations. In S. Tindall-Ford, S. Agostinho, & J. Sweller (Eds.), <i>Advances in cognitive load theory: Rethinking teaching</i> (pp. 180-193). London: Routledge. 2. Baars, M., Wijnia, L., De Bruin, A., & Paas, F. (2020). The relation between student's effort and monitoring judgments during learning: A meta-analysis. <i>Educational Psychology Review</i>. 3. Baars, M., Wijnia, L., De Bruin, A., & Paas, F. (2020). Sharing the load: A strategy to improve self-regulated learning. D. Dinsmore, L. Fryer, & M. Parkinson, <i>Handbook of strategies and strategic processing</i>. (pp. 234-247). New York: Routledge 4. Castro-Alonso, J. C., Ayres, P., Wong, M., & Paas, F. (2020). Visuospatial

	<p>tests and multimedia learning: The importance of employing relevant instruments. In S. Tindall-Ford, S. Agostinho, & J. Sweller (Eds.), <i>Advances in cognitive load theory: Rethinking teaching</i> (pp. 89-100). London: Routledge.</p> <ol style="list-style-type: none"> 5. De Koning, B., Rop. G., & Paas, F. (2020). Learning from split-attention materials: Evidence for a mental self-managed integration effect. <i>Computers in Human Behavior</i>, 110, 106379. 6. De Koning, B., Rop. G., & Paas, F. (2020). The self-management effect in learning from split-attention materials: Mental versus physical integration. <i>Contemporary Educational Psychology</i>, 61, 101873. 7. Duchi, L., Lombardi, D., Paas, F., & Loyens, S. (2020). How a growth mindset can change the climate: The power of implicit beliefs in influencing people's thoughts and actions. <i>Journal of Environmental Psychology</i>, 70, 101461. 8. Eielts, C., Pouw, W., Ouwehand, K., Van Gog, T., Zwaan, R., & Paas, F. (2020). Co-thought gesturing supports more complex problem solving in subjects with lower visual working-memory capacity. <i>Psychological Research</i>, 84, 502-513. 9. Es-Sajjade, A., & Paas, F. (in press). Educational theories and computer game design: Lessons from an experiment in elementary mathematics education. <i>Educational Technology Research and Development</i>. 10. Leppink, J., Paas, F., Van Gog, T., & Van Merriënboer, J. J. G. (2020). How to measure effects of self-regulated learning with checklists on the acquisition of task selection skills. In S. Tindall-Ford, S. Agostinho, & J. Sweller (Eds.), <i>Advances in cognitive load theory: Rethinking teaching</i> (pp. 66-79). London: Routledge. 11. Liu, T. C., Lin, Y. C., Hsu, C. Y., & Paas, F. (in press). Learning from animations and computer simulations: Modality and reverse modality effects. <i>British Journal of Educational Technology</i>. 12. Mavilidi, M., Ouwehand, K., Okely, A. D., Chandler, P., & Paas, F. (2020). Embodying learning through physical activity and gestures in preschool children. In S. Tindall-Ford, S. Agostinho, & J. Sweller (Eds.), <i>Advances in cognitive load theory: Rethinking teaching</i> (pp.103-118). London: Routledge. 13. Mavilidi, M., Ouwehand, K., Riley, N., Chandler, P., & Paas, F. (2020). The effects of an acute physical activity break on test anxiety and math test performance. <i>International Journal of Environmental Research and Public Health</i>, 17: 1523. 14. Nazlieva, N., Mavilidi, M. F., Baars, M., & Paas, F. (2020). Establishing the scientific consensus on cognitive benefits of physical activity. <i>International Journal of Environmental Research and Public Health</i>, 17, 29. 15. Paas, F., & Sweller, J. (in press). Implications of cognitive load theory for multimedia learning. In R. Mayer & L. Fiorella (Eds.), <i>The Cambridge handbook of multimedia learning 2nd edition</i>. New York: Cambridge University Press. 16. Paas, F., & Van Merriënboer, J. J. G. (2020). Cognitive load theory: Methods to manage cognitive load in the learning of complex tasks. <i>Current Directions in Psychological Science</i>, 29, 394-398. 17. Pouw, W., Wassenburg, S., Hostetter, A. B., De Koning, B. B., & Paas, F. (2020). Does gesture strengthen sensorimotor knowledge of objects? The case of the size-weight illusion. <i>Psychological Research</i>, 84, 966-980. 18. Sepp, S., Howard, S., Tindall-Ford, S., Agostinho, S., & Paas, F. (in press). Working memory: Models and applications. <i>Oxford Research Encyclopedia of Educational Psychology</i>. 19. Sepp, S., Agostinho, S., Tindall-Ford, S., & Paas, F. (2020). Gesture-based learning with ICT: Recent developments, opportunities and considerations. In S. Tindall-Ford, S. Agostinho, & J. Sweller (Eds.), <i>Advances in cognitive load theory: Rethinking teaching</i> (pp. 130-141). London: Routledge.
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20. Van Brussel, S., Verkoeijen, P., Timmermans, M., & Paas, F. (2020). "Consider the opposite" – Effects of elaborative feedback and correct answer feedback on reducing confirmation bias – a pre-registered study. *Contemporary Educational Psychology*, 61, 101844.
21. Weijers, R., De Koning, B. B., & Paas, F. (in press). Nudging in education: towards successful and responsible implication. *European Journal of Psychology of Education*.
22. Wong, M., Castro-Alonso, J. C., Ayres, P., & Paas, F. (2020). The effects of transient information and element interactivity on learning from instructional animations. In S. Tindall-Ford, S. Agostinho, & J. Sweller (Eds.), *Advances in cognitive load theory: Rethinking teaching* (pp. 80-88). New York: Routledge.
23. Xu, M. K., Koorn, P., De Koning, B., Skuballa, I., Lin, L., Henderikx, M., H. W. Marsh, Sweller, J., & Paas, F. (in press). A growth mindset leads to reduced cognitive load and improved learning: Integrating motivation and cognitive load theory. *Journal of Educational Psychology*.
24. Zhang, S., De Koning, B. B., Agostinho, S., Tindall-Ford, S., Chandler, P., & Paas, F. (in press). The cognitive load self-management principle. In R. Mayer & L. Fiorella (Eds.), *The Cambridge handbook of multimedia learning 2nd edition*. New York: Cambridge University Press.

Co-promotor's:

Dr. Lesya Ganushchak

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Lesya Ganushchak is an assistant professor at the department of Psychology, Education & Child Studies/Educational and Developmental Psychology at Erasmus University Rotterdam. Her current research is centered on the various aspects of reading comprehension (e.g., (self) monitoring your own comprehension, developing interventions to improve reading comprehension). She examines these questions using behavioral, electroencephalogram recordings (EEG), and eye-tracking methods.

Selected publications:

1. de Koning, B. B., Wassenburg, S. I., Ganushchak, L. Y., Krijnen, E., & van Steensel, R. (2019). Inferencing questions embedded in a children's book help children make more inferences. *First Language*, 40(2), 172-19.. <https://doi.org/10.1177/0142723719894770>
2. Kraal, A., van den Broek, P. W., Koornneef, A. W., Ganushchak, L. Y., & Saab, N. (2019). Differences in text processing by low-and high-comprehending beginning readers of expository and narrative texts: Evidence from eye movements. *Learning and Individual Differences*, 74, 101752.
3. de Koning, B. B., Wassenburg, S. I., Ganushchak, L. Y., Krijnen, E., & van Steensel, R. (2018). Vraag maar raak! Effecten van ingebouwde inferentievragen in voorleesboeken voor kleuters op ouder-kinderinteracties en verhaalbeprij. Stichting Lezen.
4. Ganushchak, L.Y., Konopka, A.E., & Chen, Y. (2017). Accessibility of Referent Information Influences Sentence Planning: An Eye-Tracking Study. *Frontiers in Psychology*. 8:250. doi: 10.3389/fpsyg.2017.00250
5. Ganushchak, L. Y. & Y. Chen (2016). Incrementality in planning of speech during speaking and reading aloud: evidence from eye-tracking. *Frontiers in Psychology*, 7:33. doi:10.3389/fpsyg.2016.00033
6. Christoffels, I.K., Timmer, K., Ganushchak, L.Y., & La Heij, W. (2015). On

	<p>production of interlingual homophones: delayed naming and increased N400. <i>Language, Cognition and Neuroscience</i>. 31(5), 628-638. doi:10.1080/23273798.2015.1120877</p> <ol style="list-style-type: none"> 7. Christoffels, I.K., Ganushchak, L.Y., & La Heij, W. (2016). When L1 suffers: Sustained, global slowing and the reversed language effect in mixed language context. In: J.W. Schwieter. (Ed.), <i>The Cognitive Control and Consequences of Multilingualism</i>. 8. Ganushchak, L.Y., A. Konopka, & Y. Chen (2014). What the eyes say about planning of focused referents during sentence formulation: a cross-linguistic investigation. <i>Frontiers in Psychology</i>, 5: pp. e1124. 9. Timmer, K., Ganushchak, L.Y., Ceusters, I., & Schiller, N. (2014). Second language phonology influences first language word naming. <i>Brain and Language</i>, 133, 14-25. 10. Acheson, D.J., Ganushchak, L.Y., Christoffels, I.K., & Hagoort, P. (2012). Conflict monitoring in speech production: Physiological evidence from bilingual picture naming. <i>Brain and Language</i>, 123, 131-136. 11. Ganushchak, L.Y. & Schiller, N.O. (2009). Speaking in one's second language under time pressure: An ERP study on verbal self-monitoring in German-Dutch bilinguals. <i>Psychophysiology</i>. 46, 410-419. 12. Schiller, N.O., Horemans, I., Ganushchak, L. Y. , & Koester, D. (2009). Event-related brain potentials during monitoring of speech errors. <i>NeuroImage</i>, 44, 520-530. 13. Ganushchak, L.Y. & Schiller, N.O. (2008). Brain error-monitoring activity is affected by semantic relatedness: An event-related brain potentials study. <i>Journal of Cognitive Neuroscience</i>. 20, 927-940. 14. Ganushchak, L.Y. & Schiller, N.O. (2008). Motivation and semantic context affect brain error-monitoring activity: An event-related brain potentials study. <i>NeuroImage</i>, 39, 395-405. 15. Ganushchak, L.Y. & Schiller, N.O. (2006). Effects of time pressure on verbal self-monitoring: An ERP study, <i>Brain Research</i>, 1125, 104-115. <p>Dr. Martine Baars Email address: baars@essb.eur.nl https://www.eur.nl/people/martine-baars</p> <ol style="list-style-type: none"> 1. Baars, M., Wijnia, L., de Bruin, A., & Paas, F. (2020). The relation between student's effort and monitoring judgments during learning: A meta-analysis. <i>Educational Psychology Review</i>, 1-24. doi: https://doi.org/10.1007/s10648-020-09569-3 2. Baars, M., Wijnia, L., de Bruin, A., & Paas, F. (2020). Sharing the load: Strategy to Improve Self-regulated Learning. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), <i>Handbook of Strategies and Strategic Processing</i> (pp. 234-247). Routledge, New York. 3. Nazlieva, N., Mavilidi, M. F., Baars, M., & Paas, F. (2020). Establishing a scientific consensus on the cognitive benefits of physical activity. <i>International Journal of Environmental Research and Public Health</i>, 17, 29-47. 4. Viberg, O., Khalil, M., & Baars, M. (2020, March). Self-regulated learning and learning analytics in online learning environments: a review of empirical research. In <i>Proceedings of the Tenth International Conference on Learning Analytics & Knowledge</i> (pp. 524-533). 5. Khalil, M., Wong, J., Baars, M., Zafar, F., & Wasson, B. (2019, September). Evaluating the Usability of a Study Support Mobile App for Higher Education. In <i>World Conference on Mobile and Contextual Learning</i> (pp. 85-93).
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	<p>Experimental Psychology, 72, 2313-2327. DOI: 10.1177/1747021819836713</p> <ol style="list-style-type: none"> 4. Timmer, K., Calabria, M., & Costa, A. (2019). Non-linguistic effects of language switching training. <i>Cognition</i>, 182, 14-24. DOI: 10.1016/j.cognition.2018.09.001 5. Timmer, K., Christoffels, I. K., & Costa, A. (2019). On the flexibility of bilingual language control: The effect of language context. <i>Bilingualism: Language and Cognition</i>, 22, 555-568. DOI: 10.1017/S1366728918000329 6. Timmer, K., Calabria, M., Branzi, F. M., Baus, C., & Costa, A. (2018). On the reliability of switching costs across time and domains. <i>Frontiers in Psychology</i>, 9, 1032. DOI: 10.3389/fpsyg.2018.01032 7. Timmer, K., Grundy, J. G., & Bialystok, E. (2017). Earlier and more distributed neural networks for bilinguals than monolinguals during switching. <i>Neuropsychologia</i>, 106, 245-260. DOI: 10.1016/j.neuropsychologia.2017.09.017 8. Timmer, K. & Chen, Y. (2017). Dutch-Cantonese bilinguals show segmental processing during Sinitic language production. <i>Frontiers in Psychology – Language Sciences</i>, 8, 1133. DOI: 10.3389/fpsyg.2017.01133 9. Timmer, K., Grundy, J. G., & Bialystok, E. (2017). The influence of contextual cues on representations in the mental lexicon for bilinguals. In M. Libben, M. Goral, & G. Libben (Eds.), <i>Bilingualism: A Framework for Understanding the Mental Lexicon</i> (pp. 123-142. Amsterdam, The Netherlands: John Benjamin's Publishing Company. DOI: 10.1075/bpa.6.06tim 10. Grundy, J. G., & Timmer, K. (2016). Cognitive mechanisms underlying performance differences between monolinguals and bilinguals. In J.W. Schwieter (Ed.), <i>The Cognitive Control and Consequences of Multilingualism</i> (pp. 377-397). Amsterdam, The Netherlands: John Benjamin's Publishing Company. DOI: 10.1075/bpa.2.16gru. 11. Grundy, J. G., & Timmer, K. (2016). Bilingualism and working memory capacity: A comprehensive meta-analysis. <i>Second Language Research</i>, 1-16. DOI: 10.1177/0267658316678286. 12. Christoffels, I., Timmer, K., Ganushchak, L., & La Heij, W. (2015). On the production of interlingual homophones: delayed naming and increased N400. <i>Language, Cognition and Neuroscience</i>, 31, 628-623. DOI: 10.1080/23273798.2015.1120877. 13. Kaczer, L., Timmer, K., Bavassi, L., & Schiller, N. O. (2015). Distinct morphological processing of recently learned compound words: An ERP study. <i>Brain research</i>, 1629, 309-317. DOI: 10.1016/j.brainres.2015.10.029. 14. Timmer, K., & Schiller, N.O. (2014). Neural correlates reveal sub-lexical orthography and phonology during reading aloud: a review. <i>Frontiers in Psychology</i>, 5, 884. DOI: 10.3389/fpsyg.2014.00884. 15. Timmer, K., Ganushchak, Y. A., Mitlina, Y., & Schiller, N. O. (2014). Trial by trial: selecting first or second language phonology of a visually masked word. <i>Language, Cognition and Neuroscience</i>, 29, 1059-1069. DOI: 10.1080/01690965.2013.824994. 16. Tamaoka, K., Saito, N., Kiyama, S., Timmer, K., & Verdonchot, R. G. (2014). Is pitch accent necessary for comprehension by native Japanese speakers? An ERP investigation. <i>Journal of Neurolinguistics</i>, 27, 31-40. DOI: 10.1016/j.jneuroling.2013.08.001. 17. Timmer, K., Ceusters, I., & Schiller, N. O. (2014). Second language phonology is active when using your first language. <i>Brain and Language</i>, 133, 14-25. DOI: 10.1016/j.bandl.2014.03.004. 18. Timmer, K., & Schiller, N. O. (2012). The role of orthography and phonology in English: An ERP study on first and second language reading aloud. <i>Brain Research</i>, 1483, 39-53. DOI: 10.1016/j.brainres.2012.09.004. 19. Timmer, K., Vahid-Gharavi, N., & Schiller, N. O. (2012). Reading aloud in Persian: ERP evidence for an early locus of the masked onset priming
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