

Directing mind wandering through self-regulated learning

Daniel Ebbert (daniel.ebbert@mymail.unisa.edu.au)

Supervisors: Professor Shane Dawson, Associate Professor Negin Mirriahi, Dr Srećko Joksimović, Dr Natasha Wilson

Outline



**Introduction & Literature
review**



Research Questions



Methodology



Introduction & Literature review

Introduction

- Videos used as a primary medium for instruction (Rodríguez & Pulido-Montes, 2022)
- Students adjust their learning processes to learning events (Hadwin et al., 2022)
- Distractions occur when learning (Brady et al., 2021)
- Mind wandering is a common distraction (Brady et al., 2021)

Self-regulated learning

- Framework for understanding learning
- COPES model (Winne and Hadwin, 1998)
 - Studying as self-regulated learning
 - Other models are high level
 - Chosen because it describes how learners adjust to a task
 - Specifically, how learners cope with distractions

COPES model

- COPES
 - Conditions
 - Operations
 - Searching
 - Monitoring
 - Assembling
 - Rehearsing
 - Translating
 - Products
 - Evaluation
 - Standards
- Metacognition
 - Thinking about one's thinking
 - Cycle of monitoring and control
 - Adaptations can occur at any time

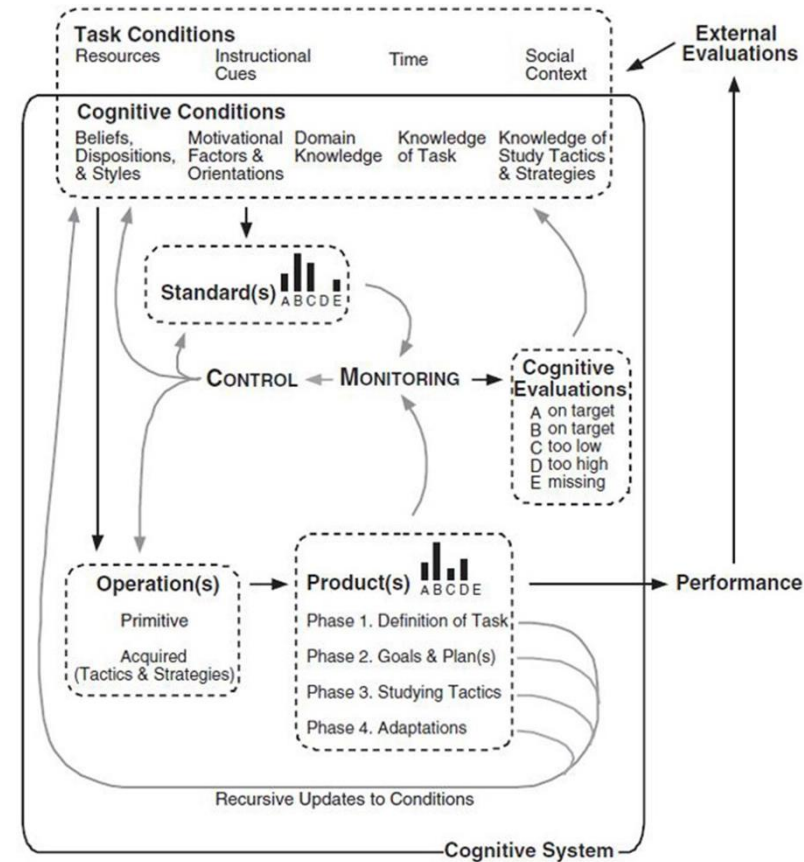


Figure 1: The COPES model of metacognitive monitoring and control in four stages of studying from Winne and Hadwin (1998)

Distractions

- Distractions when learning fall into five categories (Brady et al., 2021):
 - Motivational: instances in which students feel overwhelmed by the task
 - Behavioural: social interactions while trying to learn
 - Contextual: distractions from the environment
 - Physiological: distractions such as hunger or fatigue
 - Cognitive: task-unrelated thoughts, also called **mind wandering**

“My mind kept wandering while reading.”
(Brady et al., 2021, p. 159)

Thought classification

		Stimulus-dependency	
		Stimulus-dependent	Stimulus-independent
Task-relatedness	Task-related	<i>Being totally focused on the task currently being performed</i>	<i>Interfering thoughts related to the appraisal of the current task (Task-Related Interferences; TRIs)</i>
	Task-unrelated	<i>Sensory perceptions/sensations irrelevant to the current task (External Distractions; EDs)</i>	<i>Mind-wandering and daydreams (Stimulus-Independent and Task-Unrelated Thoughts; SITUTs)</i>

Figure 2: Classification of thoughts during a task along the dimensions of *stimulus-dependency* and *task-relatedness* (Stawarczyk et al., 2011)

Mind wandering

- Mind wandering is always going to occur (Thomson et al., 2015)
- Mind wandering occurs about 30% of the time (Wong et al., 2022)
- Negative relationship between mind wandering and learning outcome (Wong et al., 2022)
- Task-related interference can be helpful (Kane et al., 2017)

Stimulus-independent thoughts and learning

- Two approaches to reducing mind wandering (Szpunar, 2017)
 - Proactive:
 - Successful reduction of mind wandering using interpolated testing (Jing et al., 2016; Szpunar et al., 2013; Welhaf et al., 2022)
 - Effect of self-explanations is unknown
 - Writing an explanation of the current content to themselves (Fiorella & Mayer, 2015)
 - Reactive:
 - Self-realisation of the learner, called meta-awareness (Randall et al., 2022)
 - “the ability to take explicit note of the current contents of consciousness” (Schooler et al., 2011, p. 319)
 - Active metacognitive monitoring (Schooler et al., 2011)

Self-regulated learning and mind wandering

- Metacognitive monitoring is part of self-regulated learning (Winne, 2011)
- Metacognitive monitoring (meta-awareness) leads to realisation of mind wandering (Schooler et al., 2011)
- Judgement about being off-task
- Adaptation at any time (Winne and Hadwin, 1998)

Gap & Aim

- Interaction between self-regulated learning and mind wandering is unknown
 - Unknown if students adjust to the realisation of mind wandering when learning from a video
- Influence of writing self-explanations while learning from a video on mind wandering compared to interpolated testing is unknown



Research Questions & Methodology

Research Design

Study	Research Question	Method
1	RQ1: How does self-regulated learning influence mind-wandering when learning from a video?	Case Study
2	RQ2: How does self-explanation during video watching influence mind wandering compared to interpolated testing?	Experiment

Table 1: Research design

Thought report

- Self-reports from participants used to measure mind wandering (Weinstein, 2018)
- Probe-caught or self-caught (Weinstein, 2018)
- Meta-awareness can be measured using self-caught thought reports (Chu et al., 2023)

Study 1

Case Study

Method

- Previous work (Jing et al., 2016; Szpunar et al., 2013; Welhaf et al., 2022):
 - Was done in a lab
 - Limited video player interactions, hence no option to react upon mind wandering realisation
- Case study
- Setting: Several courses at UniSA
- Task: Watching a video and reporting mind wandering

Data collection

- Five subscales from the self-regulated learning online questionnaire (Broadbent et al., 2022)
 - Metacognition
 - Online Effort Regulation
 - Online Task Strategies
 - Online Planning and Time Management
 - Online Study Environment
- Self-caught mind wandering measurement using thought reports
- Video player interactions

Analysis

- Stimulus-independent thought type frequency
- Regression analysis for relationship between self-regulated learning subscales and stimulus-independent thought type frequency

Study 2

Experiment

Method

- Design based on Szpunar, et al. (2013)
 - Self-caught mind wandering measurement, instead of probe-caught
 - Open ended thought reports instead of yes / no to mind wandering probes
- Setting: Lab
 - Control for external circumstances to determine intervention effect
- Experimental conditions
 - Interpolated testing
 - Self-explanation
- Task: Watching a video, engaging in a learning activity, and reporting mind wandering using a thought report
- Sample size: 30 per group

Data collection

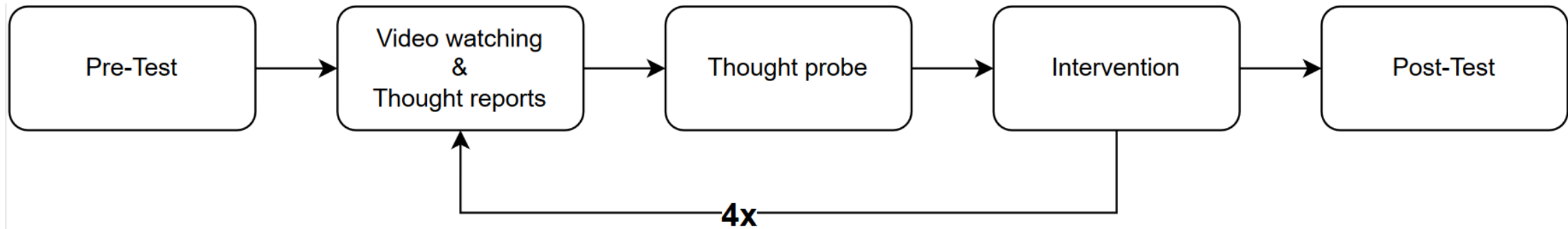


Figure 4: Data collection procedure

Analysis

- By group:
 - Determine stimulus-independent thought type frequency
 - Determine learning outcome
- Compare groups (ANOVA):
 - Stimulus-independent thought type frequency
 - Learning outcomes



Thank you for your attention!

Questions?

Contact:

daniel.ebbert@mymail.unisa.edu.au

References

- Bell, F. (2011). Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. *The International Review of Research in Open and Distributed Learning*, 12(3), 98. <https://doi.org/10.19173/irrodl.v12i3.902>
- Brady, A. C., Kim, Y., & Cutshall, J. (2021). The What, Why, and How of Distractions from a Self-Regulated Learning Perspective. *Journal of College Reading and Learning*, 51(2), 153–172. <https://doi.org/10.1080/10790195.2020.1867671>
- Broadbent, J., Panadero, E., Lodge, J. M., & Fuller-Tyszkiewicz, M. (2022). The self-regulation for learning online (SRL-O) questionnaire. *Metacognition and Learning*. <https://doi.org/10.1007/s11409-022-09319-6>
- Chu, M. T., Marks, E., Smith, C. L., & Chadwick, P. (2023). Self-caught methodologies for measuring mind wandering with meta-awareness: A systematic review. *Consciousness and Cognition*, 108, 103463. <https://doi.org/10.1016/j.concog.2022.103463>
- D'Mello, S. K., Mills, C., Bixler, R., & Bosch, N. (2017). Zone out no more: Mitigating mind wandering during computerized reading. *Proceedings of the 10th International Conference on Educational Data Mining*, 8.
- Fiorella, L., & Mayer, R. E. (2015). 7—Learning by Self-Explaining. In *Learning as a Generative Activity: Eight Learning Strategies that Promote Understanding* (1st ed., pp. 124–150). Cambridge University Press. <https://doi.org/10.1017/CBO9781107707085>
- Hadwin, A., Sukhawathanakul, P., Rostampour, R., & Bahena-Olivares, L. M. (2022). Do Self-Regulated Learning Practices and Intervention Mitigate the Impact of Academic Challenges and COVID-19 Distress on Academic Performance During Online Learning? *Frontiers in Psychology*, 13, 813529. <https://doi.org/10.3389/fpsyg.2022.813529>
- Hutt, S., Wong, A., Papoutsaki, A., Baker, R. S., Gold, J. I., & Mills, C. (2023). Webcam-based eye tracking to detect mind wandering and comprehension errors. *Behavior Research Methods*. <https://doi.org/10.3758/s13428-022-02040-x>
- Jing, H. G., Szpunar, K. K., & Schacter, D. L. (2016). Interpolated testing influences focused attention and improves integration of information during a video-recorded lecture. *Journal of Experimental Psychology: Applied*, 22(3), 305–318. <https://doi.org/10.1037/xap0000087>
- Kane, M. J., Smeekens, B. A., von Bastian, C. C., Lurquin, J. H., Carruth, N. P., & Miyake, A. (2017). A combined experimental and individual-differences investigation into mind wandering during a video lecture. *Journal of Experimental Psychology: General*, 146(11), 1649–1674. <https://doi.org/10.1037/xge0000362>
- Randall, J. G., Hanson, M. D., & Nassreelrgawi, A. S. (2022). Staying focused when nobody is watching: Self-regulatory strategies to reduce mind wandering during self-directed learning. *Applied Psychology*, 71(4), 1428–1464. <https://doi.org/10.1111/apps.12366>
- Rodríguez, M. L., & Pulido-Montes, C. (2022). Use of Digital Resources in Higher Education during COVID-19: A Literature Review. *Education Sciences*, 12(9), 612. <https://doi.org/10.3390/educsci12090612>
- Schooler, J. W., Smallwood, J., Christoff, K., Handy, T. C., Reichle, E. D., & Sayette, M. A. (2011). Meta-awareness, perceptual decoupling and the wandering mind. *Trends in Cognitive Sciences*, 15(7), 319–326. <https://doi.org/10.1016/j.tics.2011.05.006>
- Southwell, R., Mills, C., Caruso, M., & D'Mello, S. K. (2022). Gaze-based predictive models of deep reading comprehension. *User Modeling and User-Adapted Interaction*. <https://doi.org/10.1007/s11257-022-09346-7>
- Stawarczyk, D., Majerus, S., Maj, M., Van der Linden, M., & D'Argembeau, A. (2011). Mind-wandering: Phenomenology and function as assessed with a novel experience sampling method. *Acta Psychologica*, 136(3), 370–381. <https://doi.org/10.1016/j.actpsy.2011.01.002>
- Szpunar, K. K. (2017). Directing the Wandering Mind. *Current Directions in Psychological Science*, 26(1), 40–44. <https://doi.org/10.1177/0963721416670320>
- Szpunar, K. K., Khan, N. Y., & Schacter, D. L. (2013). Interpolated memory tests reduce mind wandering and improve learning of online lectures. *Proceedings of the National Academy of Sciences*, 110(16), 6313–6317. <https://doi.org/10.1073/pnas.1221764110>
- Thomson, D. R., Besner, D., & Smilek, D. (2015). A Resource-Control Account of Sustained Attention: Evidence From Mind-Wandering and Vigilance Paradigms. *Perspectives on Psychological Science*, 10(1), 82–96. <https://doi.org/10.1177/1745691614556681>
- Wachtler, J., Hubmann, M., Zöhrer, H., & Ebner, M. (2016). An analysis of the use and effect of questions in interactive learning-videos. *Smart Learning Environments*, 3(1), 13. <https://doi.org/10.1186/s40561-016-0033-3>
- Weinstein, Y. (2018). Mind-wandering, how do I measure thee with probes? Let me count the ways. *Behavior Research Methods*, 50(2), 642–661. <https://doi.org/10.3758/s13428-017-0891-9>
- Welhaf, M. S., Phillips, N. E., Smeekens, B. A., Miyake, A., & Kane, M. J. (2022). Interpolated testing and content pretesting as interventions to reduce task-unrelated thoughts during a video lecture. *Cognitive Research: Principles and Implications*, 7(1), 26. <https://doi.org/10.1186/s41235-022-00372-y>
- Winne, P. H. (2011). A Cognitive and Metacognitive Analysis of Self-Regulated Learning. In D. H. Schunk & B. Zimmerman (Eds.), *Handbook of Self-Regulation of Learning and Performance* (1st ed., pp. 15–32). Routledge.
- Winne, P. H., & Hadwin, A. F. (1998). Studying as Self-Regulated Learning. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in Educational Theory and Practice* (1st ed., pp. 277–304). Routledge
- Wong, A. Y., Smith, S. L., McGrath, C. A., Flynn, L. E., & Mills, C. (2022). Task-unrelated thought during educational activities: A meta-analysis of its occurrence and relationship with learning. *Contemporary Educational Psychology*, 71, 102098. <https://doi.org/10.1016/j.cedpsych.2022.102098>
- Wozniak, K. (2015). Supporting Adult Learners' Metacognitive Development with a Sociotechnical System [Doctoral dissertation]. DePaul University.