FACULTY OF PSYCHOLOGY
AND EDUCATIONAL SCIENCES

DEPARTMENT OF EDUCATIONAL STUDIES

ENHANCING COLLABORATIVE LEARNING: THE IMPACT OF REGULATION SUPPORT ON STUDENT INTERACTIONS

Karen Putzeys, Mareike Ehlert, Fien De Smedt, and Bram De Wever

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TECOLAB

Universität Münster

1. INTRODUCTION

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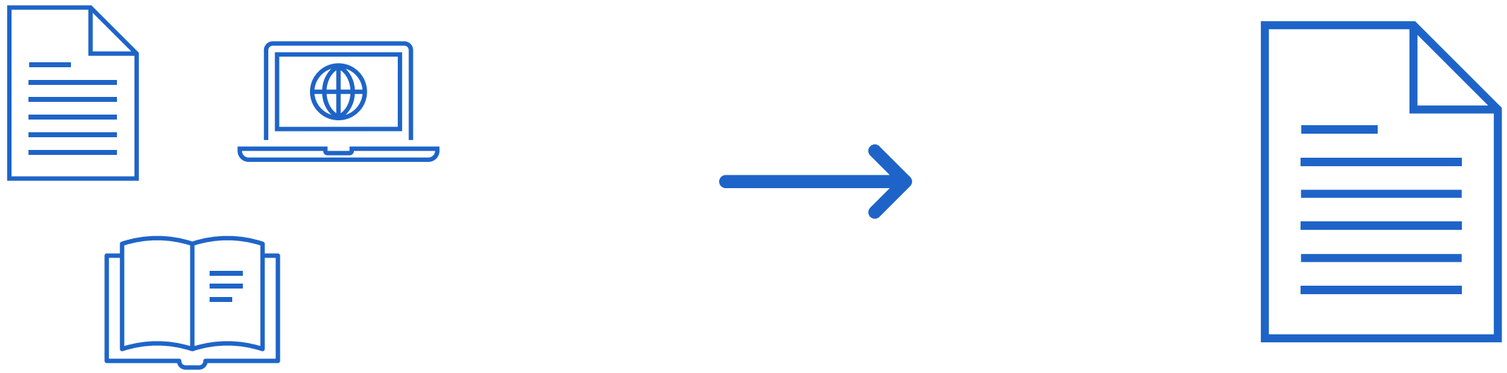
- Computer-supported collaborative learning (CSCL)
  - Collaborative writing: research papers *(Spivey & King, 1989)*



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DEVELOPING COLLABORATION SKILLS

- "Through experience" (instruction is often lacking) *(Ferrer-Balas & Papell, 2025)*
  - Cognitive psychology: learning through reorganization of knowledge *(King, 2007)*
  - Social constructivism: interaction influences this process *(Vygotsky, 1978)*

- University students: many collaboration experiences → opportunity to build knowledge on how to collaborate

HOWEVER…

Collaborative writing processes often do NOT automatically run smoothly

(Malmberg et al., 2015; Vuorenmaa et al., 2023)

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SCRIPT THEORY OF GUIDANCE *(FISCHER ET AL., 2013)*

- Every student possesses an individual internal collaboration script
  - Resides in student's memory
  - Consists of knowledge on collaborative learning situations

- Group members' internal scripts do not necessarily align
- Internal scripts can be dysfunctional *(Radkowitsch et al., 2020)*
- Internal scripts are often not sufficiently externalized *(Putzeys et al., under review)*

REGULATING COLLABORATION

- Students should regulate their collaboration process collectively.
- Regulation
  - supports smooth group dynamic
  - increases likelihood of achieving desired outcomes *(De Backer et al., 2015; Isohätälä et al., 2017; Järvelä et al., 2015; Miller & Hadwin, 2024; Vuorenmaa et al., 2023; Wang et al., 2017)*

→ Knowledge on effective regulation strategies needed

→ Externalization of internal scripts needed

- regulation strategies developed and refined through verbal interactions *(De Backer et al., 2015; Vuorenmaa et al., 2023)*

TEACHING REGULATION

- Students struggle
  - to independently apply effective regulation strategies from their internal scripts *(Schnaubert & Vogel, 2022)*
  - to externalize internal scripts *(Putzeys et al., under review)*

! Importance of:

- teaching effective regulation strategies
- Teaching techniques for externalizing these strategies in group settings

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FOUR KEY REGULATION STRATEGIES FOR COLLABORATIVE LEARNING

1. Orientation
2. Planning
3. Monitoring
4. Evaluation

(De Backer et al., 2016; Isohätälä et al., 2019; Järvelä et al., 2019; Miller & Hadwin, 2024; Vuorenmaa et al., 2023)

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1. ORIENTATION

Students should profoundly discuss:

- Prior knowledge on text type
- Former collaboration experiences
- Perception of current task
- Task requirements

(e.g., Miller & Hadwin, 2024; Pintrich, 2004; Putzeys & De Wever, 2020)

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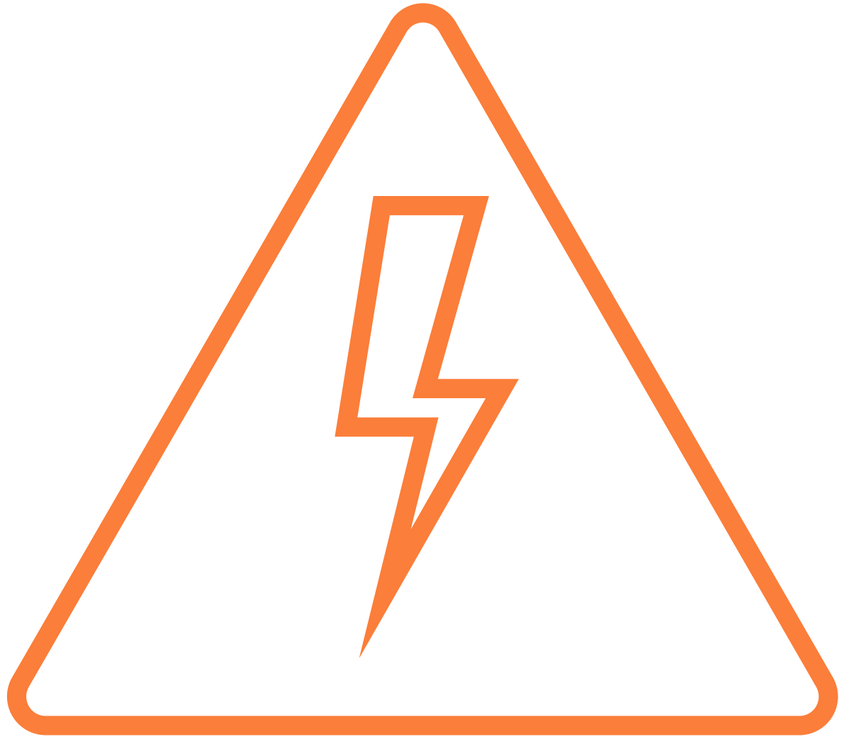
- Task perceptions often misaligned *(Hadwin et al., 2018)*, yet not expressed *(Näykki et al., 2017; Putzeys et al., under review)*
- Former collaboration experiences not expressed *(Putzeys et al., under review)*



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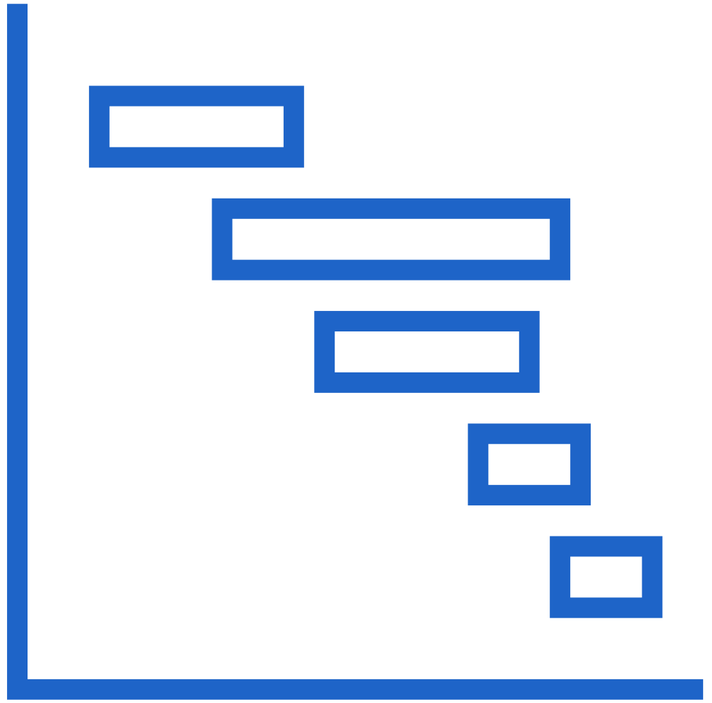
2. PLANNING

- Students should profoundly discuss:
  - Plan of how to tackle current task as a group
    - Timing, task division…

    (Isohätälä et al., 2019; Miller & Hadwin, 2024)
  - Outline of their text
    - Content, structure…

    (Harris & Graham, 2009)



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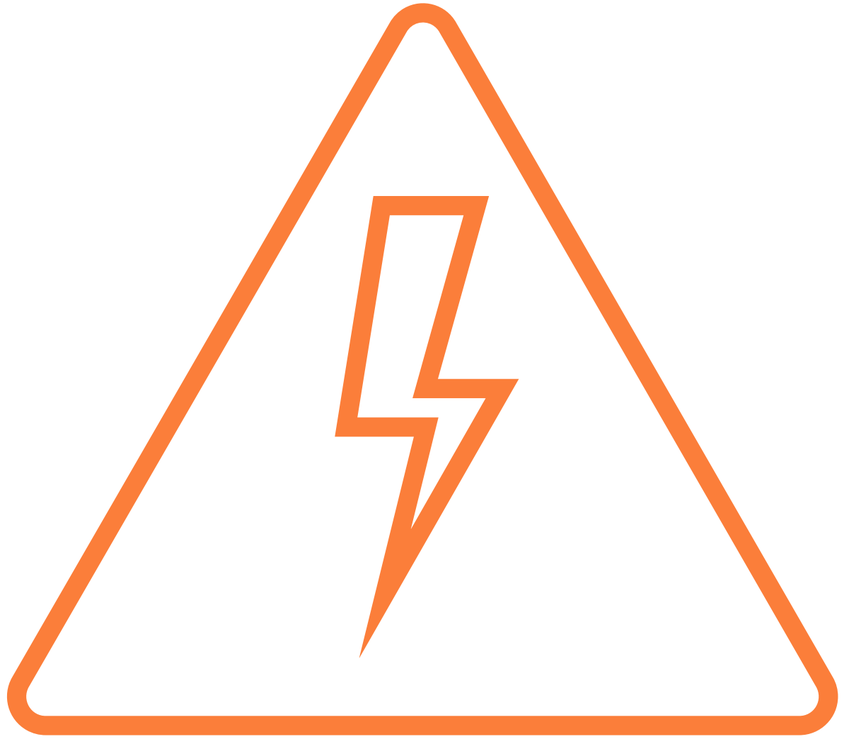
- Struggle with effective planning

  (Hadwin et al., 2018; Järvelä et al., 2015).
- Assumption: “Group members will do what I think they will do, no need for discussing a plan” *(Zhang et al., 2021).*



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3. MONITORING

- Taking on meta-perspective and discuss:
  - their process
  - the text contents, maintaining sense of shared understanding
- Adapting approach adequately (if needed)

(Hadwin et al., 2018)

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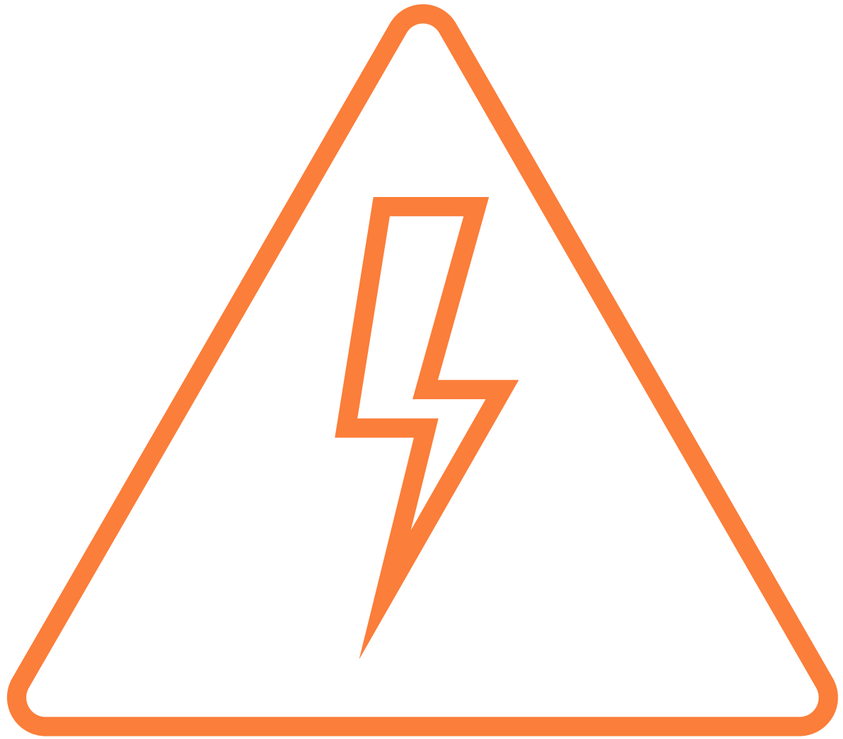
- Continuous process *(De Backer et al., 2015)*
- Not always of high-quality *(Järvelä et al., 2016; Näykki et al., 2017)*



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4. EVALUATION

- Students should profoundly discuss:
  - Text quality
    - Checking task requirements
    - Strengths and weaknesses
  - Process quality
    - Strengths and weaknesses

(Panadero et al., 2015; Strauß et al., 2024)

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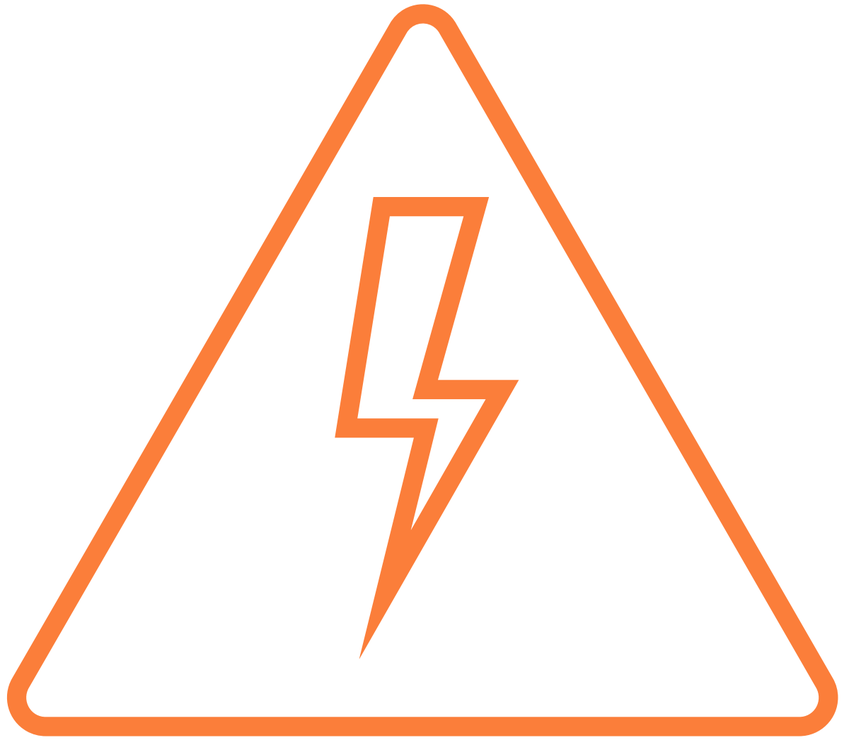
- Evaluation of both process and text often omitted *(Näykki et al., 2017; Zhang et al., 2021)*



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- Poor regulation results in:
  - Inefficient processes
  - Weaker products

- Teaching regulation needed!
  - Scripting
    - Form of socio-cognitive scaffolding *(Schnaubert & Vogel, 2022)*

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SCRIPTING REGULATION

- Scripting as a valuable support for improving regulation processes *(Miller & Hadwin, 2024; Schnaubert & Vogel, 2022; Wang et al., 2017)*

- Sequence of instructions aimed at provoking these interactions between students that naturally do not occur, at the adequate time during the process *(Kollar et al., 2007)*

- Goal = having the students internalize the script over time, enabling them to activate effective regulation strategies stored in their internal script during future similar collaboration situations *(King, 2007; Radkowitsch et al., 2020)*

RESEARCH QUESTIONS

1. To what extent can a **script** designed to **externalize four key regulation strategies** (i.e., orientation, planning, monitoring, and evaluation) **impact regulation-related interactions** in small groups of university students collaboratively writing texts?
   a. How does the **quantity** of regulation-related interactions differ between groups using a regulation script and groups not using a regulation script?
   b. How does the **quality** of regulation-related interactions differ between groups using a regulation script and groups not using a regulation script?
2. To what extent does the **quality of texts** collaboratively written by scripted groups differ from those written by non-scripted groups?

2. METHODS

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2.1 CONTEXT AND PARTICIPANTS

- Academic writing course for social sciences students
- Participation in the study entirely voluntary (informed consent)
- *N* = 76 students (*M* = 21.35 years, *SD* = 1.11)
  - Organized into 20 groups of three to four members
  - Self-select group members

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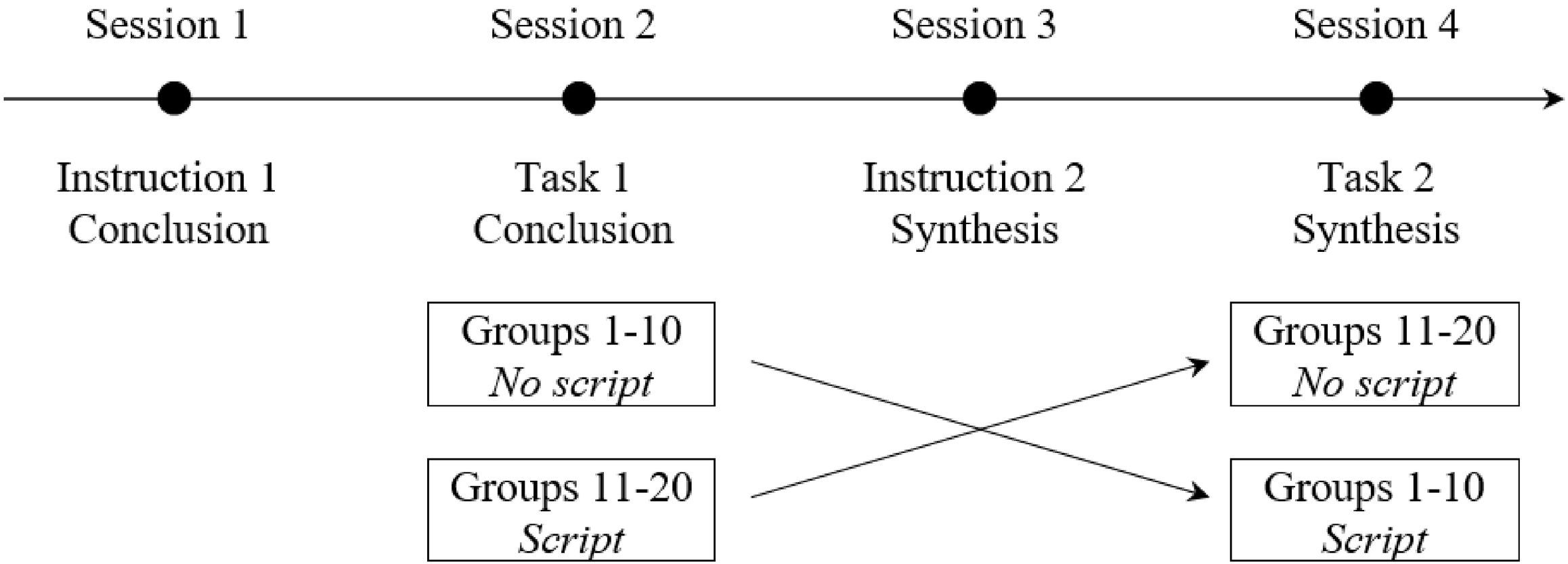
2.2 PROCEDURE



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2.3 SCRIPT

- Identical for both tasks
- Google Doc
  - Non-scripted: only very brief introduction
  - Scripted: four strategies to read and discuss
    - Orientation
    - Planning
    - Monitoring
    - Evaluation

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SCRIPT CONTENTS

- Name of the strategy
- Concise explanation
  - Purpose
  - Importance
- Questions to discuss
  - E.g., “How will you evaluate the quality of your text?” (Evaluation)

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2.4 MEASURES AND DATA ANALYSES

- **RQ 1a: Quantity of regulation-related interactions**
  - Transcripts with time stamps > Units of Meaning > One code per unit
  - Coding scheme based on literature
  - Multivariate linear mixed effects analysis

- **RQ 1b: Quality of regulation-related interactions**
  - Rubric (1 to 5), for Orientation, Planning, Monitoring, Evaluation
  - Based on entire transcript
  - Multivariate linear mixed effects analysis

- **RQ 2: Text quality**
  - Benchmark rating procedure
  - Univariate linear mixed effects analysis

3. RESULTS

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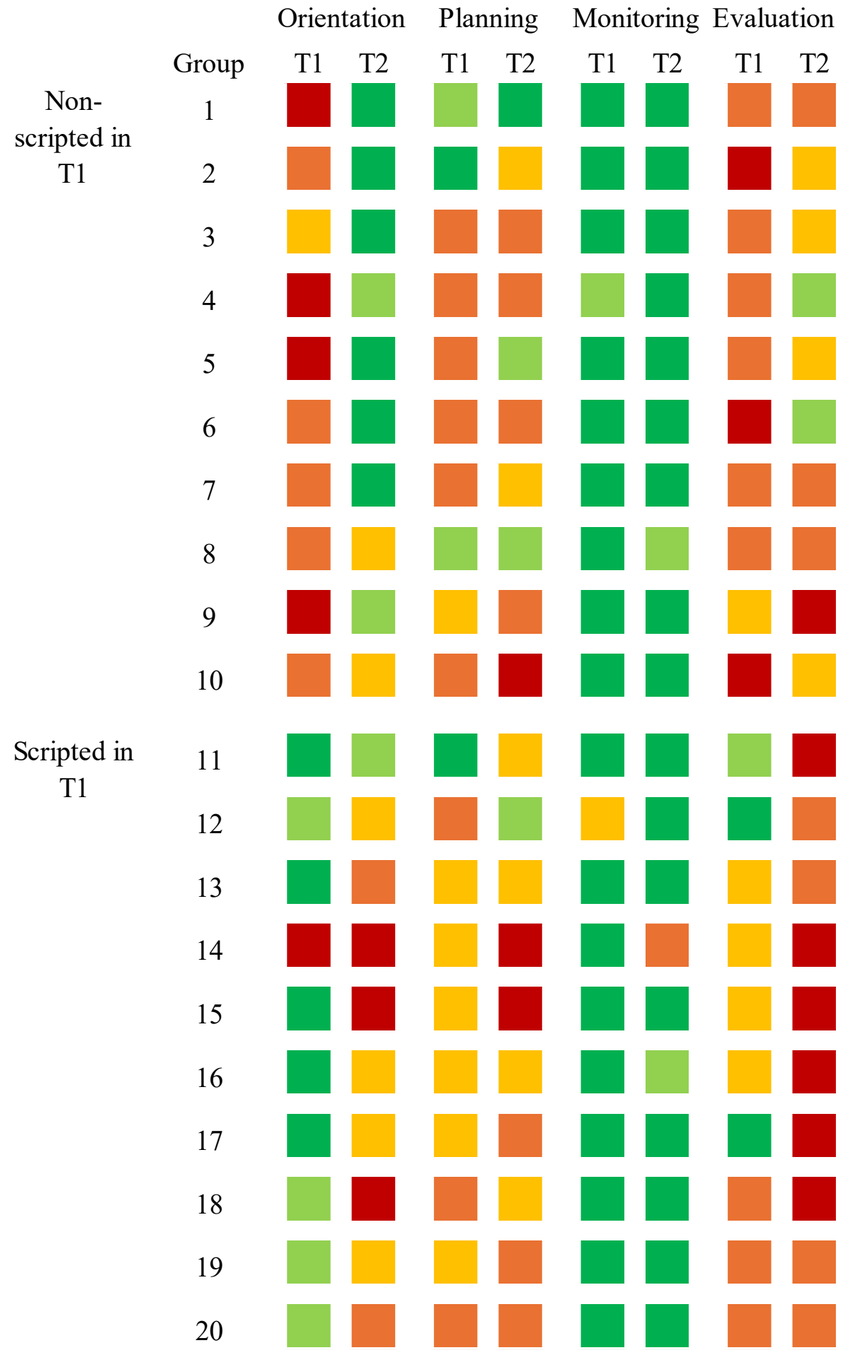
RQ 1a: QUANTITY OF REGULATION-RELATED INTERACTIONS

				All interactions			Regulation-related interactions		
Task	Condition	Script	N	M (SD)	Min.	Max.	M (SD)	Min.	Max.
T1	1	No	10	46.36 (15.95)	16.93	67.33	41.97 (14.1)	15.83	59.02
	2	Yes	10	61.48 (14.49)	49.67	95.9	56.39 (11.13)	47.37	78.63
T2	2	No	10	61.36 (20.88)	28.07	98.25	53.81 (19.0)	26.33	90.27
	1	Yes	10	71.44 (27.57)	18.08	105.23	62 (25.85)	15.88	97.17

	Task	Condition	Script	*M (SD)*	*b*	*t*	*p*
Orientation	T1	1	No	1.36 (0.92)	-0.86	-4.15	< .001***
		2	Yes	4.93 (2.69)			
	T2	2	No	4.00 (2.71)	0.33	1.583	0.116
		1	Yes	5.66 (1.97)			
Planning	T1	1	No	2.05 (0.78)	-0.73	-3.53	.001**
		2	Yes	6.03 (4.06)			
	T2	2	No	5.17 (1.67)	0.10	0.49	0.63
		1	Yes	5.1 (1.98)			
Monitoring	T1	1	No	37.43 (13.36)	-0.13	-0.65	0.52
		2	Yes	43.17 (8.68)			
	T2	2	No	44.43 (19.86)	0.13	0.62	0.54
		1	Yes	50.03 (25.56)			
Evaluation	T1	1	No	1.12 (1.11)	-0.54	-2.58	.011*
		2	Yes	2.26 (1.14)			
	T2	2	No	0.17 (0.2)	0.99	4.82	< .001***
		1	Yes	1.22 (0.8)			

RQ 1b: QUALITY OF REGULATION-RELATED INTERACTIONS

	Task	Condition	Script	*M (SD)*	Estimate (Mean Diff)	*t*	*p*
Orientation	T1	1	No	1.7 (0.67)	-2.5	-6.28	< .001 ***
		2	Yes	4.2 (1.23)			
	T2	2	No	2.3 (1.06)	2.1	5.27	< .001 ***
		1	Yes	4.4 (0.84)			
Planning	T1	1	No	2.8 (1.14)	-0.1	-0.25	.802
		2	Yes	2.9 (0.88)			
	T2	2	No	2.4 (0.97)	0.4	1	.317
		1	Yes	2.8 (1.23)			
Monitoring	T1	1	No	4.9 (0.32)	0.1	0.25	.802
		2	Yes	4.8 (0.63)			
	T2	2	No	4.6 (0.97)	0.3	0.75	.453
		1	Yes	4.9 (0.32)			
Evaluation	T1	1	No	1.8 (0.63)	-1.4	-3.52	.001 **
		2	Yes	3.2 (1.14)			
	T2	2	No	1.4 (0.52)	1.3	3.26	.001 **
		1	Yes	2.7 (0.95)			



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RQ 2: TEXT QUALITY

- No sig. fixed effect of condition, $t(32.35) = 0.281$, $p = .780$
- No sig. fixed effect of task, $t(18.00) = 0.943$, $p = .358$
- Interaction between condition and task n.s., $t(18.00) = 1.472$, $p = .158$

4. DISCUSSION, LIMITATIONS AND SUGGESTIONS

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RQ 1: QUANTITY & QUALITY OF REGULATION-RELATED INTERACTIONS

Scripted groups sig. outperformed non-scripted groups (✓) :

Quantity		
Strategy	**Task 1**	**Task 2**
Orientation	✓	
Planning	✓	
Monitoring		
Evaluation	✓	✓

Quality		
Strategy	**Task 1**	**Task 2**
Orientation	✓	✓
Planning		
Monitoring		
Evaluation	✓	✓

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- Groups scripted in task 1, but not in task 2 may have partially internalized script by task 2
- Lack of effect on monitoring
  1. Design features of the script
     - Under-scripting (while being cautious for over-scripting) *(Dillenbourg, 2002)*
     - Specific questions worked better than broad questions
       - E.g. Orientation: “How did you collaborate before in similar tasks?” vs. Monitoring: “How will you make sure that you monitor your entire process?”
  2. Nature of the two tasks (synchronous, short time frame, clear deadline)

RQ 2: TEXT QUALITY

- No effect on text quality
  - Not due to time constraints (no evidence in transcripts)
  - More plausible explanation: script was not explicitly designed to improve text quality directly

OPPORTUNITIES TO IMPROVE OUR SCRIPT

1. More specific scaffolding *(Kirschner et al., 2009)*
    1. Planning: ask for specific plan concerning process *and* text
    2. Monitoring: e.g., prompt students during task

        e.g., *"Pause to check if your current approach is effective"*

2. More focus on directly impacting text quality
    1. Especially text planning *(Van Ockenburg et al., 2021)*

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FUTURE RESEARCH

- Replication study with bigger sample size
- Identical text types in both tasks
- Investigate long-term effects of adapted version of our script (planning and monitoring)

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TAKE-AWAY: OUR SCRIPT…

- aids university students in learning how to regulate their collaborative writing, especially in terms of orientation and evaluation

- teaches students to externalize their regulation strategies, and enables them to internalize effective regulation strategies which students can draw upon in future collaborative tasks.

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Karen Putzeys
Karen.Putzeys@UGent.be

dr. Mareike Ehlert
Mareike.Ehlert@uni-muenster.de

dr. Fien De Smedt (Presenting author)
Fien.DeSmedt@UGent.be

Prof. dr. Bram De Wever
Bram.DeWever@UGent.be