

Interplay of temporal changes in self-regulation, academic success and physiological synchrony

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Collaborative learning



or





SRL

SRL

“SRL refers to a learner’s deliberate planning, monitoring and regulating of cognitive, behavioral, motivational and emotional processes towards task completion” (Hadwin, Jarvela & Miller, 2011).



Measuring SRL

- **as a stable aptitude**
 - Surveys
- **as a process**
 - Digital learning traces (Hadwin, Nesbit, Jamieson-Noel, Code, & Winne, 2007).
 - thinking-aloud procedures (Bannert & Mengelkamp, 2008).
 - Lag-sequential analysis (Bakeman & Quera, 2011)
 - physiological signals (Azevedo et al., 2016).



Physiological data & SRL

Autonomic nervous system can provide objective information about real-time alterations in cognitive and affective states (Henriques, Paiva, & Antunes, 2013).

For Example

Cognitive load, (Fairclough, Venables, & Tattersall, 2005)

motivation and effort, (Gendolla & Richter, 2005)

Attention (Ravaja, 2004).



Physiological synchrony (PS)

PS is defined as “any interdependent or associated activity identified in the physiological processes of two or more individuals” (Palumbo et al., 2016, p. 2).

PS has been associated with several psychosocial constructs important for social cognition and successful collaboration (e.g., empathy and shared understanding) (Järvelä, Kivikangas, Katsyri, and Ravaja, 2013; Marci, Ham, Moran, & Orr, 2007).

Several studies have found PS to predict group performance (Elkins et al., 2009; Montague, Xu, & Chiou, 2014; Walker, Muth, Switzer, & Rosopa, 2012).



The Current study

The aim of this study is to examine the temporal changes of SRL processes during collaborative learning and their relationship to academic achievement.

Research questions:

- 1) Are there any relationships between behavioral, cognitive, motivational, and emotional changes and academic achievement?
- 2) Are there any relationships between the PS of students and their self-reports about behavioral, cognitive, motivational, and emotional change during learning sessions?
- 3) Is there any relationship between the PS of students and their academic success?



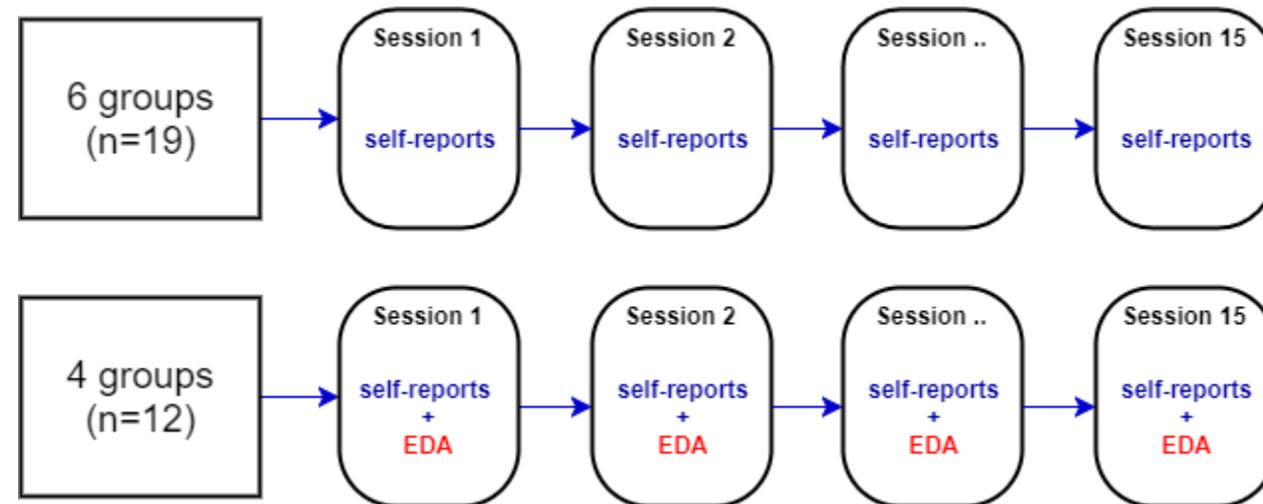
Methodology

Participants and the context

Participants were 31 (23 males, 8 females) high school students in an advanced physics course.

EdX Online platform was used to guide participants in collaborative tasks.

Data Collection





Methodology

Measures

Academic achievement scores

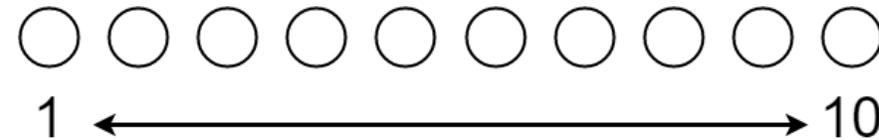
written exam (36 points)

group task (6 points)

final score (42 points)

Electrodermal activity (EDA)

One-item Likert type questionnaires on SRL:



“I know/knew what to do” (cognition)

“I am/was motivated to work” (motivation)

“My feelings right now” (emotion)

“How did/will your group work during collaboration?”
(behavior)

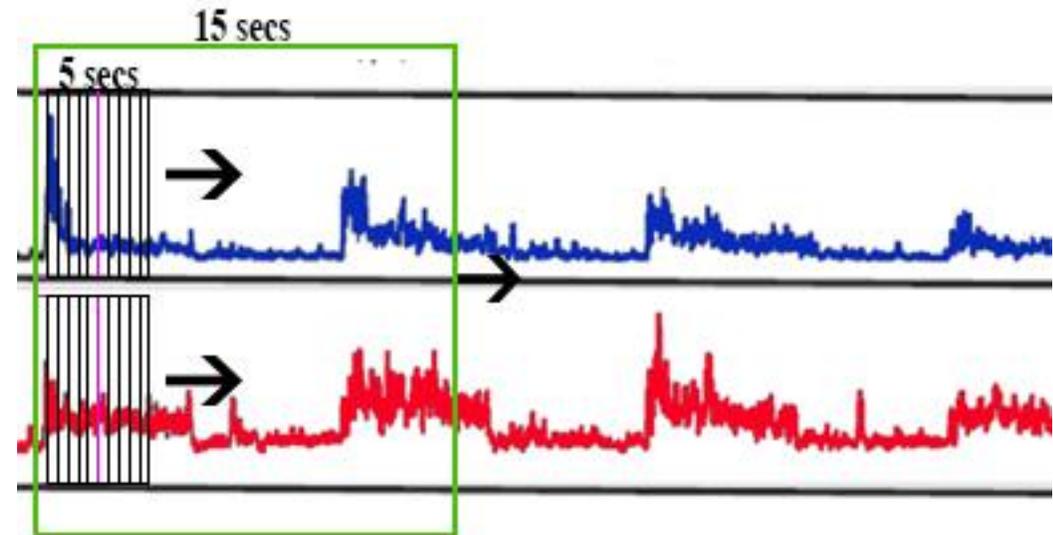


Methodology

Data Analysis

Session-based changes in self-reported behavior, cognition, motivation, and emotion

Session Synchrony Index (SSI) (Marci et al.,





Results

RQ 1) Are there any relationships between behavioral, cognitive, motivational, and emotional regulatory processes and academic achievement?

Table 1. Correlations between the SRL dimensions and academic achievement scores of students.

N = 31	Cognitive change	Motivational change	Emotional change	Written exam	Group task	Final score
Behavioral change	.469**	.500**	.287	.167	.017	.179
Cognitive change		.305	.303	.036	.018	.062
Motivational change			.624**	.351	.331	.391*
Emotional change				.152	.417*	.178
Written exam					.106	.995**
Group task						.165



Results

RQ 2) Are there any relationships between the PS of students and their self-reports about behavioral, cognitive, motivational, and emotional change during learning sessions?

RQ 3) Is there any relationship between the PS of students and their academic success?

Table 2. Correlations between PS, SRL, and academic achievement of dyads.

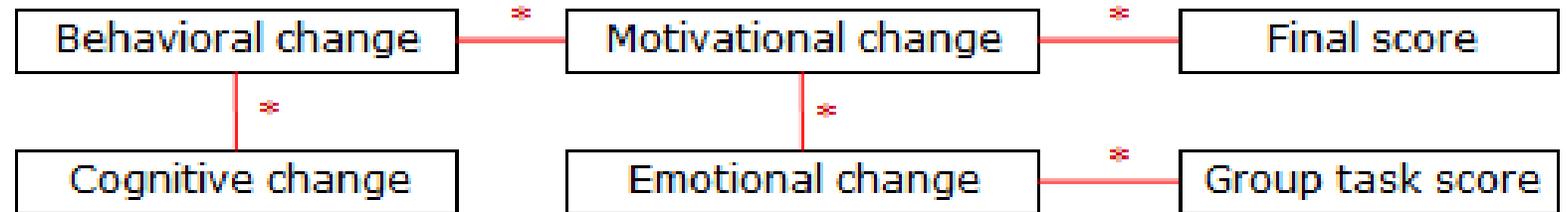
n=12	Written exam	Final score	Behavioral change	Cognitive change	Motivational change	Emotional change
SSI	.372	.37	.211	.642*	.517	.404

* $p < .05$



Discussion

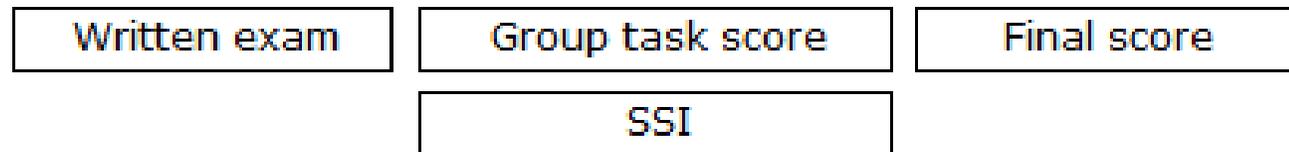
RQ1



RQ2



RQ3





Thank you for listening!

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