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

M. Dindar, J. Malmberg, S. Jarvela, & P. Kirschner
Collaborative learning

or

?
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**
  - 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**

- **6 groups (n=19)**: Sessions include self-reports.
- **4 groups (n=12)**: Sessions include self-reports and EDA.
Metholodogy

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 elf-reported behavior, cognition, motivation, and emotion

Session Synchrony Index (SSI) (Marci et al., 2007)
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.

<table>
<thead>
<tr>
<th></th>
<th>Cognitive change</th>
<th>Motivational change</th>
<th>Emotional change</th>
<th>Written exam</th>
<th>Group task</th>
<th>Final score</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral change</td>
<td><strong>.469</strong></td>
<td><strong>.500</strong></td>
<td>.287</td>
<td>.167</td>
<td>.017</td>
<td>.179</td>
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<tr>
<td>Cognitive change</td>
<td>.305</td>
<td>.303</td>
<td>.036</td>
<td>.018</td>
<td>.062</td>
<td>.391*</td>
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<tr>
<td>Motivational change</td>
<td></td>
<td><strong>.624</strong></td>
<td>.351</td>
<td>.331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written exam</td>
<td></td>
<td></td>
<td></td>
<td>.152</td>
<td>.417*</td>
<td>.178</td>
</tr>
<tr>
<td>Group task</td>
<td></td>
<td></td>
<td></td>
<td>.106</td>
<td>.995**</td>
<td></td>
</tr>
<tr>
<td>Final score</td>
<td></td>
<td></td>
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</tbody>
</table>

*Significant at p < 0.05
**Significant at p < 0.01
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.

<table>
<thead>
<tr>
<th></th>
<th>Written exam</th>
<th>Final score</th>
<th>Behavioral change</th>
<th>Cognitive change</th>
<th>Motivational change</th>
<th>Emotional change</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSI</td>
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<td>.37</td>
<td>.211</td>
<td>.642*</td>
<td>.517</td>
<td>.404</td>
</tr>
</tbody>
</table>

* p < .05
Discussion

RQ1
- Behavioral change * to Motivational change *
- Cognitive change *
- Emotional change *
- Final score
- Group task score

RQ2
- Behavioral change *
- Cognitive change *
- SSI
- Motivational change
- Emotional change

RQ3
- Written exam
- Group task score
- Final score
- SSI
Thank you for listening!

Contact details:
muhterem.dindar@oulu.fi
Twitter: @muhteremdindar

www.oulu.fi/let
Twitter: @LET_Oulu
References


