Researching socially shared regulation in learning

LAK webinar

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In my talk

Our SSRL research agenda and it's theoretical grounding

Methodological efforts and analysis for understanding SSRL

What we have achieved this far?

Why understanding SSRL is important?

What is critical for learning success in 21st century?

(a) ability to adapt to new situations and challenges and engage in complex problem solving

(b) social skills necessary for communicating and collaborating productively and proficiently,

(c) socio-emotional skills and empathy necessary for tackling challenging problems, and

(d) ability to take initiative set goals and monitor self and others.

A new set of uniquely human skills and competencies that machines cannot match or replicate will be necessary.

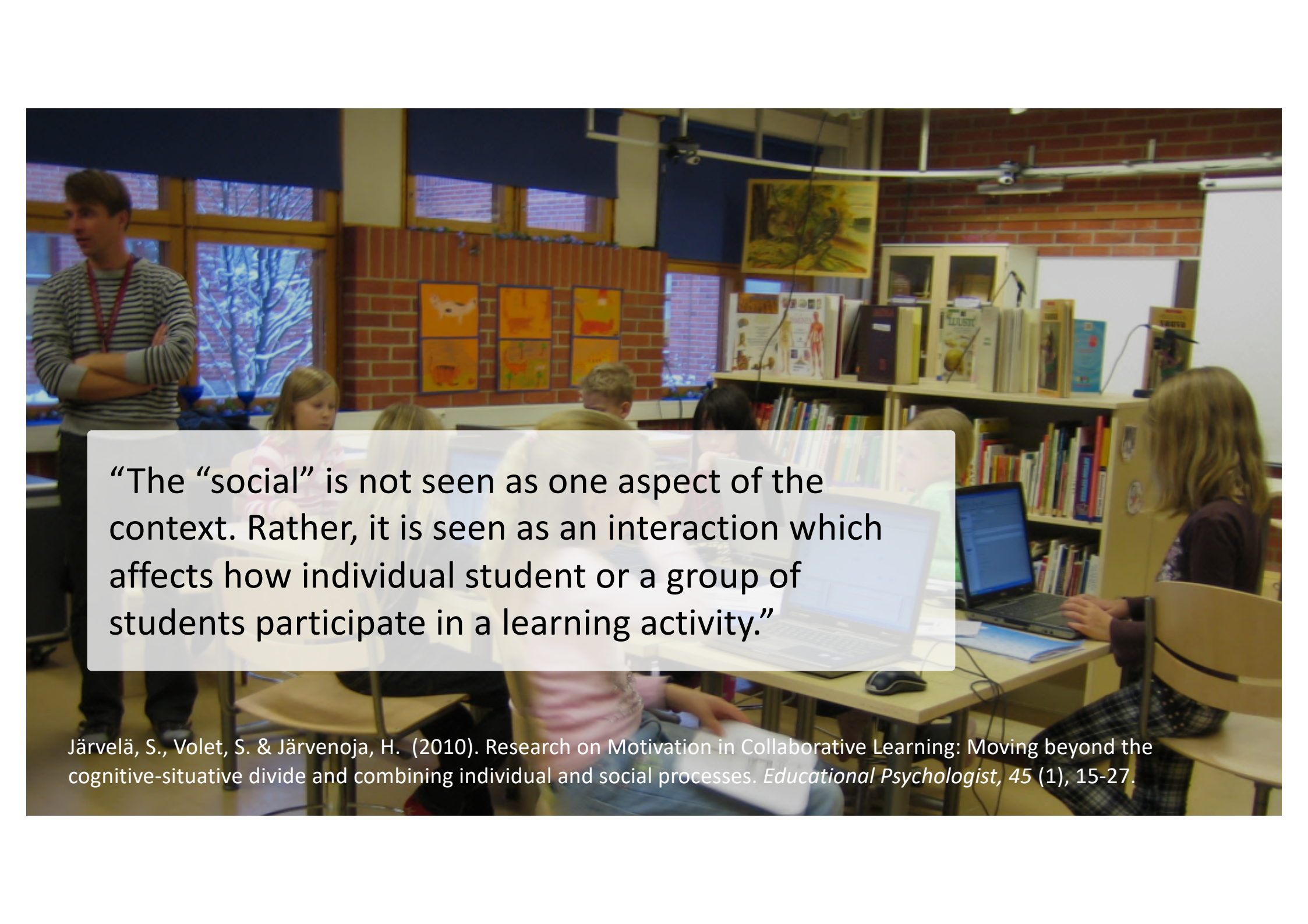# Epistemic understanding of active mind(s)

Complex interaction of cognition, motivation, emotion and metacognition

Interaction with individual minds in social context

Brandsford et al. 1999, Greeno, 2006; Pintrich, Marx & Boyle, 1993; Resnick, Levine & Teasley, 1991; Salomon, 1991

"The "social" is not seen as one aspect of the context. Rather, it is seen as an interaction which affects how individual student or a group of students participate in a learning activity."

Järvelä, S., Volet, S. & Järvenoja, H. (2010). Research on Motivation in Collaborative Learning: Moving beyond the cognitive-situative divide and combining individual and social processes. *Educational Psychologist, 45* (1), 15-27.

Learners can monitor
and regulate their learning
"experimenting with your learning"

M e t a c o g n i t i o n

scanning internal and external factors - goals and plans
- activating the plans - re-examine to adapt

Learning is a complex process

motivation

affect

metacognition

cognition

emotion

What is self-regulated learning?

(Winne & Hadwin, 1998; Zimmerman 2010; Järvelä, Hadwin, Malmberg & Miller, 2018)

Active and proactive learning

Process of learning to monitor, evaluate, and regulate (or change) your own
- Thinking
  - Motivation
    - Emotion
      - Behaviour
        - Learning

Adaptive process that <u>you</u> develop and refine over time

8

Hadwin, A. F., Järvelä, S., & Miller, M. (2018). Self-regulation, co-regulation and shared regulation in collaborative learning environments (pp. 83-106). In D. Schunk, & J. Greene, (Eds.). *Handbook of Self-Regulation of Learning and Performance*.

What is *regulation* in learning?

(Winne & Hadwin; 1998; Hadwin, Järvelä & Miller, 2018; Järvelä & Hadwin, 2014; Järvelä, Hadwin Malmberg & Miller, 2018)

It is a response to **situated challenges** in learning task

Regulation is about **strategic adaption** by individual's or groups.

It is a **cyclical phenomena** and past experiences contribute to regulation.

Multifaceted: cognition, motivation, emotion, behavior

Task, culture and learning environment are evolving features

What is NOT regulation in learning?

It is not an outcome - It sets a stage for learning and collaboration.

It is not random adaptation, but intentional.

More than coordinated action, interaction, and communication.

It is not knowledge construction.

Collaborative learning

Collaborative and socioemotional interactions, transactions and knowledge building processes have **temporal and multidimensional** nature which in the optimal cases are successfully **shared** in between the collaborating partners.

(Kirschner, Sweller, Kirschner & Zambrano, 2018)
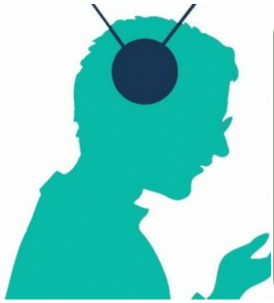
We develop theoretical understanding of socially shared regulation in collaborative learning

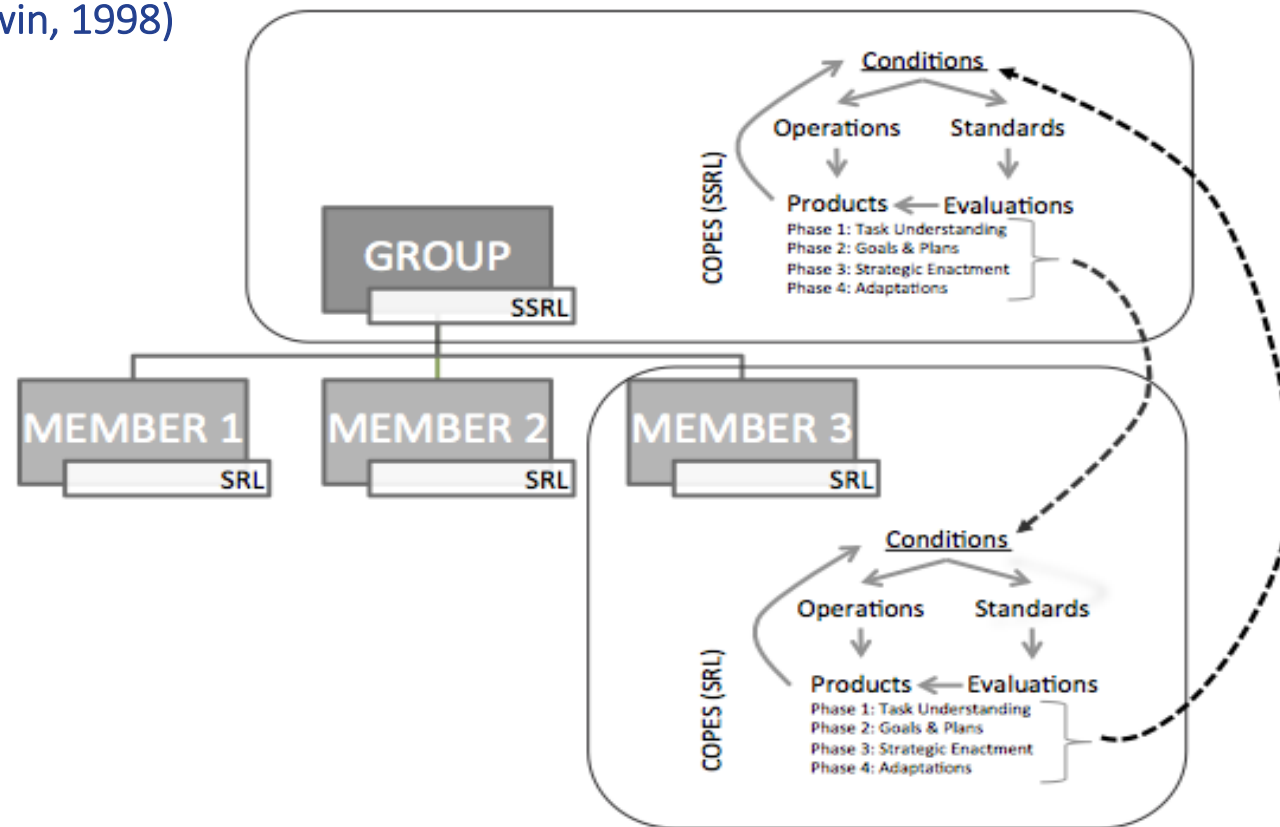We study when, how and what makes regulation in collaborative learning functional

We implement our understanding of regulation to utilize advanced learning technologies to support learning

A model of individuals' SRL cycles

(Winne & Hadwin, 1998)

Hadwin, A. F., Järvelä, S., & Miller, M. (2018). Self-regulation, co-regulation and shared regulation in collaborative learning environments (pp. 83-106). In D. Schunk, & J. Greene, (Eds.). *Handbook of Self-Regulation of Learning and Performance* (2nd) Ed. New York, NY: Routledge.

Socially shared regulation in learning - SSRL

Achieving success in collaborative tasks depends upon:

a) co-constructing shared task representations, shared goals, and shared strategies

b) regulating learning through shared metacognitive monitoring and control of cognition, motivation, emotion and behavior

Järvelä, S., Hadwin, A.F,. Malmberg, J. & Miller. M. (2018). Contemporary Perspectives of Regulated Learning in Collaboration. In F. Fischer, C.E. Hmelo-Silver, Reimann, P. & S. R. Goldman (Eds.). *Handbook of the Learning Sciences*. Taylor & Francis.
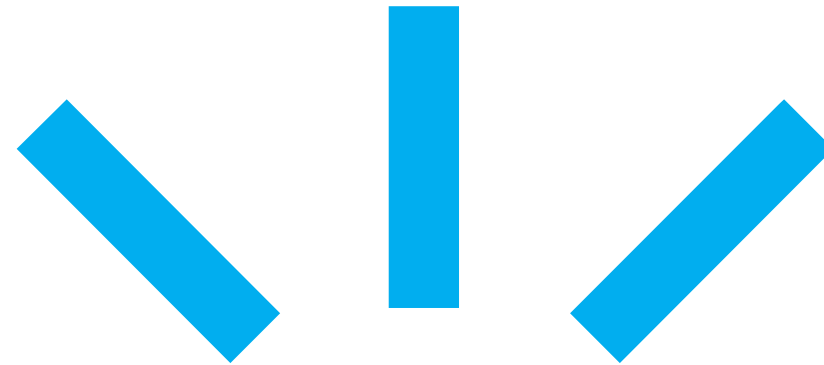
Methodological efforts
for understanding SSRL

University of Oulu

Our studies
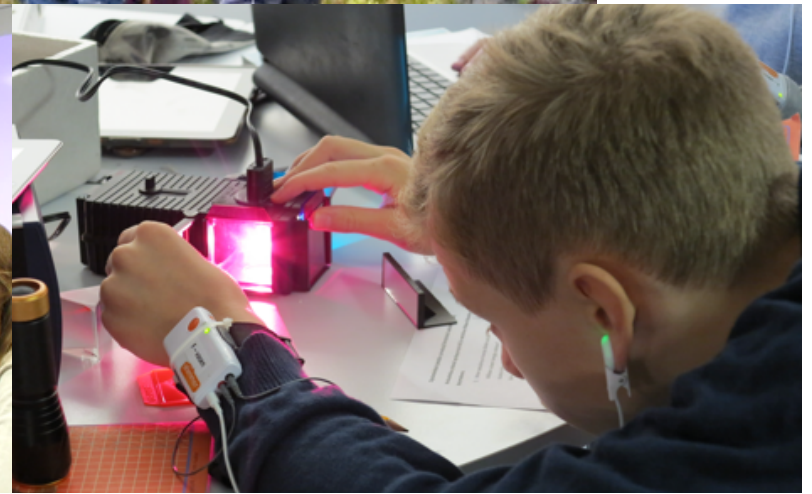
Studying SSRL

T e m p o r a l i t y

P a t t e r n s

Interaction of c o g n i t i v e and n o n − c o g n i t i v e processes

C o n t e x t u a l affordances

"S h a r i n g" interaction in a metacognitive level

Järvelä, S., Järvenoja, H. & Malmberg. J. (2019). Capturing the dynamic and cyclical nature of regulation: Methodological progress in understanding socially shared regulation in learning. *International journal of Computer Supported Collaborative Learning*. In press. https://doi.org/10.1007/s11412-019-09313-2

Järvenoja, H., Järvelä, S., Törmänen, T., Näykki, P., Malmberg, J., Mykkänen, A., & Isohätälä, J. (2018). Capturing motivation and emotion regulation during a learning process. *Frontline Learning Research 6 (3) DOI* https://doi.org/10.14786/flr.v6i3.369

Multimodal data collection

360-degree video
capture + audio

Mobile
eye tracking

Multisensor devices that
track student
physiological activation

Logdata, situated
questionnaires,
evaluation forms,
student products

What we have achieved in understanding SSRL this far?

1. Why regulation is important in collaborative learning?

Regulation is critical for the progress of collaborative learning (Järvelä et al., 2016).

Regulation is situated in group interaction. (Isohätälä, Näykki & Järvelä, 2019; Kurki et al, 2019)

Regulation can be targeted on cognitive, emotional and motivational processes. (Järvenoja, Näykki, Törmänen & Järvelä, 2019)

2. How regulation occurs in collaborative learning

Challenges in groups are triggers to activate regulation
(Järvenoja, Näykki, Törmänen & Järvelä, 2019)

**Metacognitive awareness is required to recognize regulation need**
(Sobocinski et al., 2020).

Regulation is manifested in individual and group level (Dindar et al., 2020).

Interaction, behavior and physiological activations can indicate the conditions for regulation in collaborative learning
(Haataja, Malmberg, & Järvelä, 2018; Malmberg, Fincham, Pijeira-Díaz, Järvelä & Gasevic, 2019).

When students monitor learning together, they tend to synchronize physiologically with each other
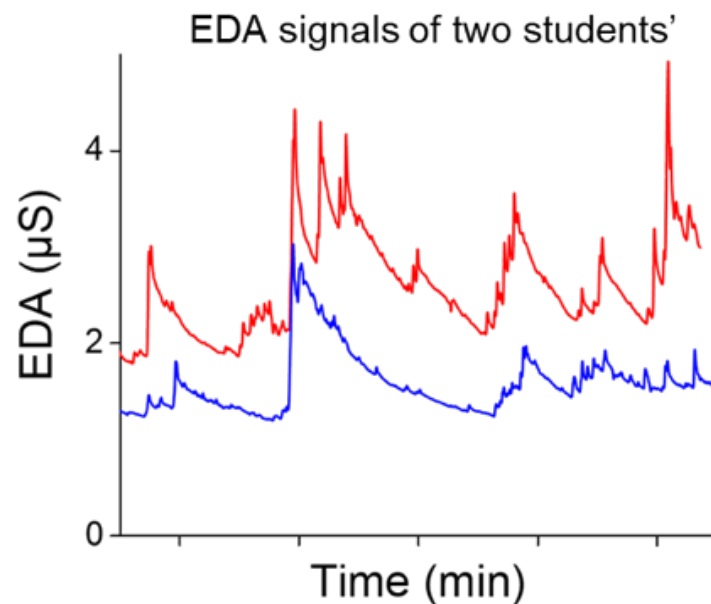
Haataja, E., Malmberg, J., & Järvelä, S. (2018). Monitoring in collaborative learning: Co-occurrence of observed behavior and physiological synchrony explored. *Computers in Human Behavior*, *87*, 337–347. https://doi.org/10.1016/j.chb.2018.06.007

Emotionally relevant situations in group call for emotion regulation

- the observed emotional reactions (video) and physiological reactions (EDA) in CL
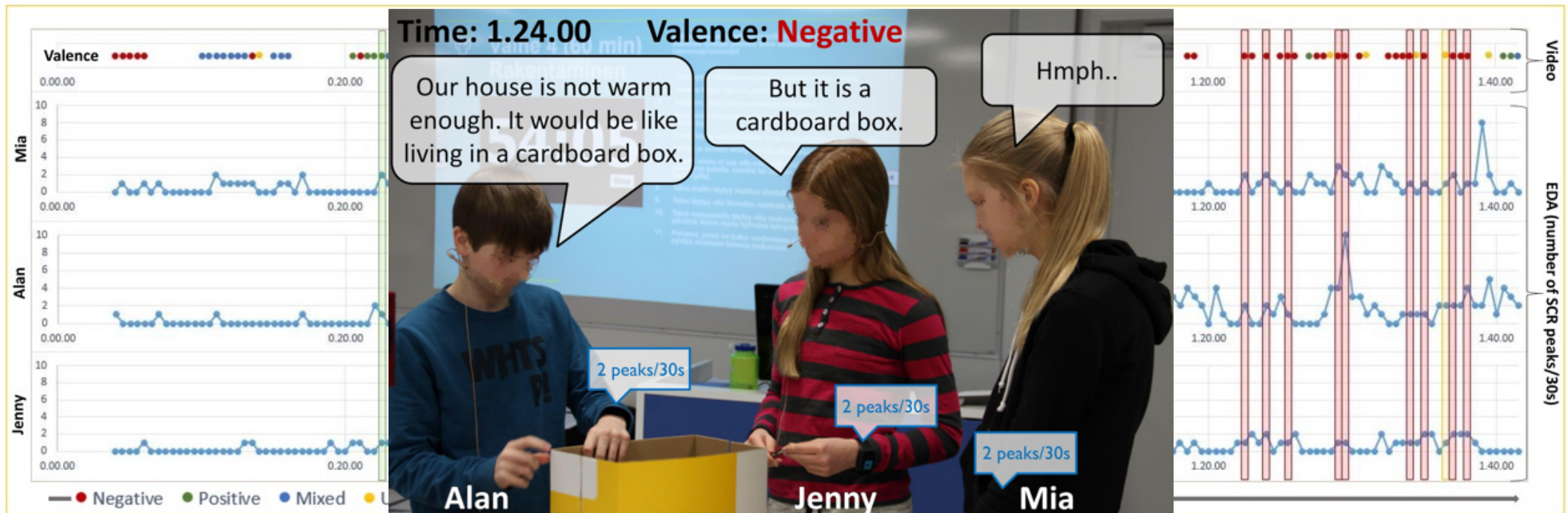

Järvenoja, H., Järvelä, S., Törmänen, T., Näykki, P., Malmberg, J., Kurki, K., … Isohätälä, J. (2018). Capturing motivation and emotion regulation during a learning process. *Frontline Learning Research*, *6*(3), 85–104.

What follows socially shared monitoring?

Physiological state transitions discovered by machine learning methods are more frequent in sessions when groups are on-track and there is a low need for regulation
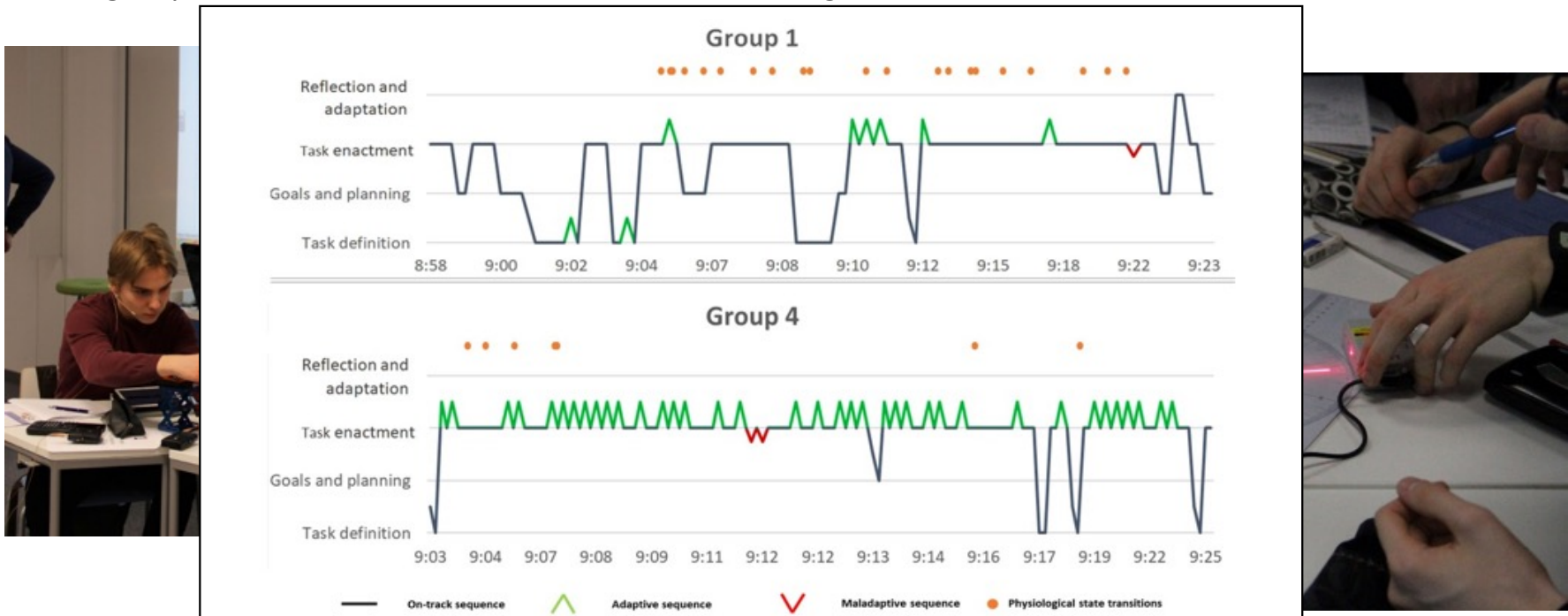
Sobocinski, M., Malmberg, J., Dindar, M., Järvelä, S., Isosalo, A. & Noponen, K. (2020). How does monitoring set the stage for adaptive or maladaptive behavior in collaborative learning? *Metacognition and Learning*

3. How regulation can be supported for collaborative learning

Pedagogical designs and technological tools (Järvelä et al., 2016; Järvenoja et al., 2020) for:

> Increasing awareness of collaborative learning process
>
> Prompting use of regulation strategies
>
> Give learning process feedback for teachers and learners

Multidisciplinary efforts for AI support

(Järvelä, Järvelä, S., Gasevic, D., Seppänen, T., Pechenizkyi, 2020)
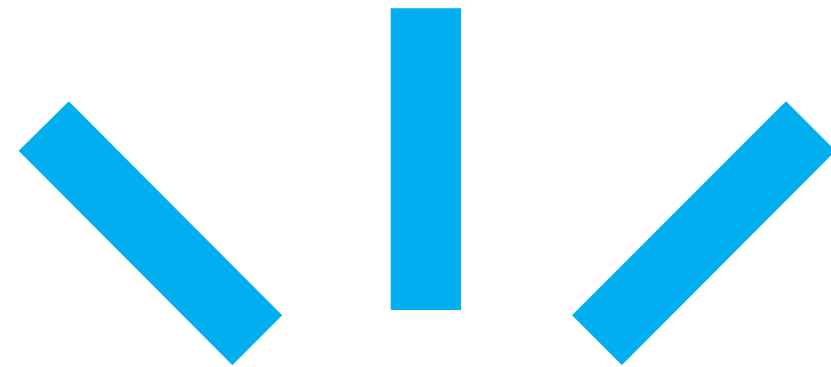
SSRL & LA ?

The learning sciences help us understand human learning processes.

SRL, CoRL, and SSRL theories help us understand the strategic regulation of those processes in learning.

LA helps to understand mechanisms of regulation and provide targeted support when needed.

Data's correspondence to observed events

⋊
&

Humans are agentic, interpretive
and use situated resources
(physical, symbolic, social)

Patterns, sequences, regularities,
causalities, models...

Järvelä & Bannert (Eds.) (2019). Temporal and adaptive processes of regulated learning - what can multimodal data tell? Special issue in *Learning and Instruction*

SSRL multimodal process data channels
- what data can reflect what event?

	Cognition	Metacognition	Affect/Emotions	Motivation
Log files	■	■		
Eye tracking	■	■		
Physiological sensors	▦	■	■	
360° video+audio	■	■	■	■
Facial recognition	▦		■	
Situated self-reports	■	■	■	■

Järvelä, S., Malmberg, J., Haataja, E., Sobosincki, M. & Kirschner, P. (2019). What multimodal data can tell us about the self-regulated learning process? *Learning and Instruction*.

Why understanding SSRL is important?

Theory building

ELSEVIER

Learning and Instruction

New data modalities, traces and representations of cognition, motivation, emotion and metacognition to explain mechanisms of regulation in learning

What multimodal data can tell us about the students' regulation of their learning process?

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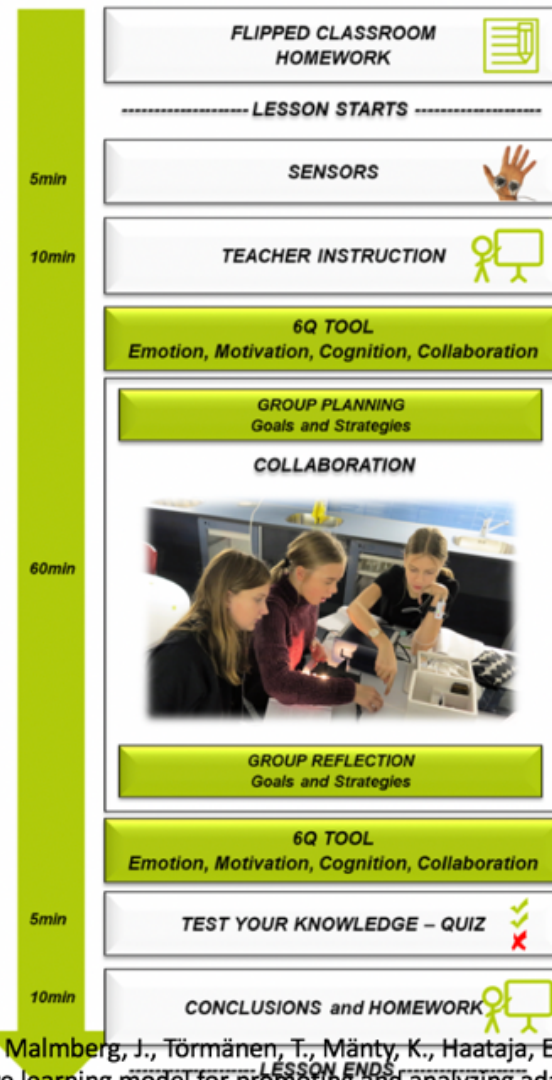[b] Open University of the Netherlands, Netherlands

Practical supp

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Online e... & retros... S-

Collabora

Awarene

Reflectio

Regulati

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Understanding and p...
Learning 11(3), 263-

Järvelä, S., Kirschner, P. A., Panadero, E., Ma...
Socially Shared Regulation in Collaborative Lea...
and Development, 63, 1, 125-142.

FLIPPED CLASSROOM
HOMEWORK

-------------------- LESSON STARTS --------------------

5min — SENSORS

10min — TEACHER INSTRUCTION

6Q TOOL
Emotion, Motivation, Cognition, Collaboration ········ QRiDi

GROUP PLANNING
Goals and Strategies ········ QRiDi

COLLABORATION

60min

GROUP REFLECTION
Goals and Strategies ········ QRiDi

6Q TOOL
Emotion, Motivation, Cognition, Collaboration

5min — **TEST YOUR KNOWLEDGE – QUIZ**

10min — *CONCLUSIONS and HOMEWORK*

-------------------- LESSON ENDS --------------------

Järvenoja, H., Malmberg, J., Törmänen, T., Mänty, K., Haataja, E., Ahola, S. & Järvelä, S. (2019).
A collaborative learning model for promoting and analyzing adaptive motivation and emotion
regulation science classroom.

...SCL.
...ative

GenZ

STRENGTHENING
HUMAN CAPABILITIES!

Generation Z and beyond: Co-evolution of human
capabilities and intelligent technologies in the 21st
century

OULUN YLIOPISTO

ACADEMY OF FINLAND

Järvelä, S., Gasevic, D., Seppänen, T., Pechenizkyi, M. (2020). Bridging Learning Sciences, Machine Learning, and Affective Computing for Understanding Cognition and Affect in Collaborative Learning. *British Journal of Educational Technology*. DOI:10.1111/bjet.12917

~~How humans react to and use new technologies ?~~

How human scientists can participate co-evolution of human capabilities and intelligent technologies

GenZ
STRENGTHENING
HUMAN CAPABILITIES!

What if the digital future was not driven by digital technologies but by humans?

https://www.youtube.com/watch?reload=9&v=wUvTFEFvABs
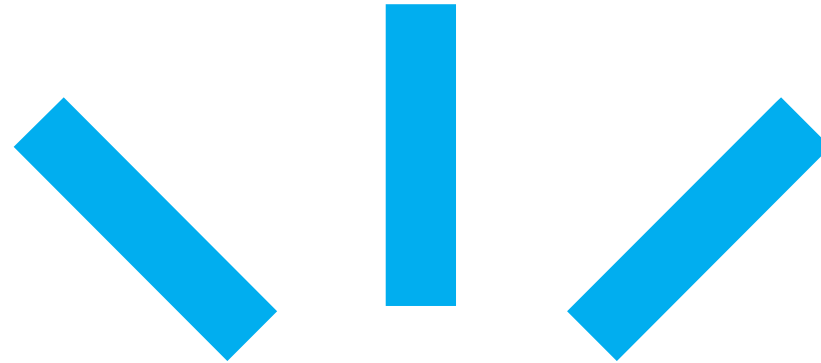
Thank You

www.oulu.fi/let/
www.slamproject.org
Twitter: @LET_Oulu
@SannaJarvela

Recent publications:

Dindar, M. Malmberg, J., Järvelä, S., Haataja, E. , & Kirschner, P. A. (2019). Matching self-reports with electrodermal activity data: Investigating temporal changes in self-regulated learning. *Education and Information Technologies.* In press*.*

Dindar, M., Alikhani, I., Malmberg, J., Järvelä, S., Seppänen, T. (2019). Examining shared monitoring in collaborative learning: A case of a recurrence quantification analysis approach. *Computers in Human Behavior, 100*, 335- 344.

Haataja, E., Malmberg, J., & Järvelä, S. (2018). Monitoring in collaborative learning: Co-occurrence of observed behavior and physiological synchrony explored. *Computers in Human Behavior*. https://doi.org/10.1016/j.chb.2018.06.007

Hadwin, A. F., Järvelä, S., & Miller, M. (2018). Self-regulation, co-regulation and shared regulation in collaborative learning environments (pp. 83-106). In D. Schunk, & J. Greene, (Eds.). *Handbook of Self-Regulation of Learning and Performance* (2nd) Ed. New York, NY: Routledge.

Isohätälä, J., Näykki, P., Järvelä, S. & Baker, M.J. (2019). Critical moments for collaborative learning: when regulation and socio-emotional processes converge in social interaction. *Scandinavian Journal of Educational Research*. DOI: 10.1080/00313831.2019.1623310.

Isohätälä, J., Näykki, P. & Järvelä, S. (2019). Cognitive and Socio-Emotional Interaction in Collaborative Learning: Exploring Fluctuations in Students' Participation*. Scandinavian Journal of Educational Research*, DOI: 10.1080/00313831.2019.1623310.

Järvelä, S., Hadwin, A.F,. Malmberg, J. & Miller. M. (2018). Contemporary Perspectives of Regulated Learning in Collaboration (pp. 127-136). In F. Fischer, C.E. Hmelo-Silver, Reimann, P. & S. R. Goldman (Eds.). *Handbook of the Learning Sciences*. Taylor & Francis.

Järvelä, S., Malmberg, J., Haataja, E., Sobosincki, M. & Kirschner, P. (2019). What multimodal data can tell us about the self-regulated learning process? *Learning and Instruction*. https://doi.org/10.1016/j.learninstruc.2019.04.004

Järvelä, S., Järvenoja, H. & Malmberg. J. (2019). Capturing the dynamic and cyclical nature of regulation: Methodological progress in understanding socially shared regulation in learning. *International Journal of Computer Supported Collaborative Learning* 4, 425-441. https://doi.org/10.1007/s11412-019-09313-2

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Järvelä, S., Gasevic, D., Seppänen, T., Pechenizkyi, M. (2020). Bridging Learning Sciences, Machine Learning, and Affective Computing for Understanding Cognition and Affect in Collaborative Learning. *British Journal of Educational Technology*. DOI: 10.1111/bjet.12917

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Järvenoja, H., Järvelä, S. & Malmberg, J. (2017). Supporting groups' emotion and motivation regulation during collaborative learning. *Learning and Instruction*. DOI: 10.1016/j.learninstruc.2017.11.004.

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Malmberg, J., Järvelä, S., Holappa, J., Haataja, E., Huang, X., & Siipo, A. (2018). Going beyond what is visible: What multichannel data can reveal about interaction in the context of collaborative learning? *Computers in Human Behavior, 96, 235-245* doi.org/10.1016/j.chb.2018.06.030

Malmberg, J., Haataja, E., Seppänen, T., & Järvelä, S. (2019). Are we together or not? The temporal interplay of monitoring, physiological arousal and physiological synchrony during a collaborative exam. *International Journal of Computer Supported Collaborative Learning 14 , 467-490.* https://doi.org/10.1007/s11412-019-09311-4

Pijeira-Díaz, H. J., Drachsler, H., Järvelä, S. & Kirschner, P. A. (2018). Sympathetic arousal commonalities and arousal contagion during collaborative learning: How attuned are triad members? *Computers in Human Behavior 92*, 188-197. https://doi.org/10.1016/j.chb.2018.11.008

Pijeira-Díaz, H. J., Drachsler, H., Järvelä, S. & Kirschner, P. A. (2018). Sympathetic arousal commonalities and arousal contagion during collaborative learning: How attuned are triad members? *Computers in Human Behavior 92*, 188-197. https://doi.org/10.1016/j.chb.2018.11.008

Sobocinski, M., Malmberg, J. & Järvelä, S. (2016). Exploring temporal sequences of regulatory phases and associated interaction types in collaborative learning tasks. *Metacognition and Learning.* doi:10.1007/s11409-016-9167-5

Sobocinski, Järvelä, Malmberg, Dindar, Isosalo & Noponen (2020). How does monitoring set the stage for adaptive regulation or maladaptive behavior in collaborative learning? A multimodal analysis. *Metacognition & Learning*