Shared Regulation in an Activity Oriented Learning Setting

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12th ICM, September 4th, 2010, Porto

Learning Spaces (Lernwerkstatt)

- Active cognitive engagement of students
- Challenging and authentic tasks and materials
- Experimentation and exploration
- Core themes (natural sciences): water, bridges, flying, climate

Theoretical framework

Self-regulated learning

- Active and constructive engagement in a process of meaning generation
- Adaptation of thoughts, feelings, and actions as needed
- Influenced by contextual and individual differences

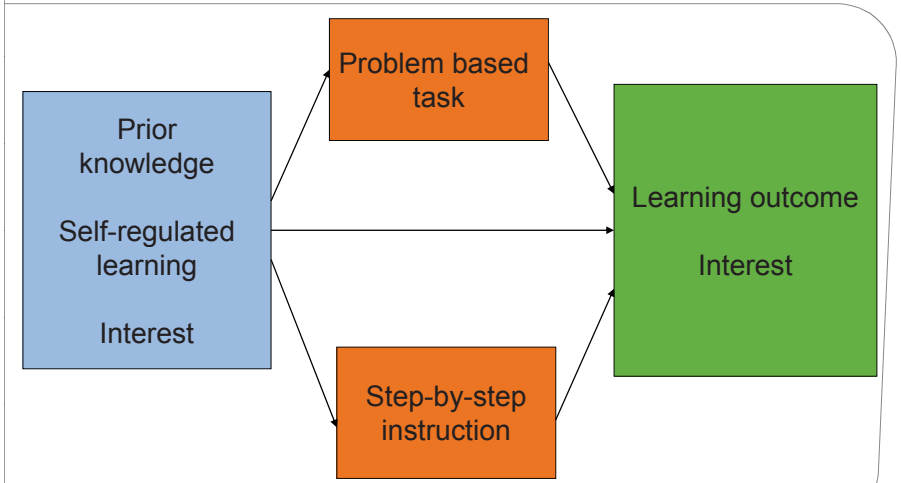
(Boekaerts & Corno, 2005)

Inquiry-based learning

- Curriculum provides flexibility for students to design and carry out their own investigations
- Students are consistently active, teachers use hands-on and minds-on activities that encourage open ended, student-initiated investigations and explorations

(Llewellyn, 2007; OECD, 2006; Rocard et al., 2007)

Research Questions (I)



Task for the study

Experiment in the context of climate change: Albedo effect

Problem based task

- Problem and material for problem-related experiments are provided
- Prompt to discuss the problem and the experiment they want to pursue
- Free choice of how to approach problem

Step-by-step instruction

- Problem and material for problem-related experiments are provided
- Directives of how to solve the problem are provided with a step-by-step instruction

Research questions (II)

- How do pairs of primary school children share the regulation of the activity oriented learning process under two conditions (problem based vs. step-by-step instruction)?
- Are there differences between pairs with different levels of SRL (high, low and mixed ability to self-regulate the learning process)?

Methods of data collection

- Questionnaires:
  - Self-regulated learning (Bruder, 2006; Wild & Schiefele, 1994)
  - Interest for the topic, familiarity with environmental issues (Frey et al., 2009)
  - Knowledge about natural sciences and climate change
  - Achievement goals (Spinath et al., 2002)

  4^{th} - 6^{th} grade students (N = 158)
  mean age: 11.2 years (range: 9 to 14 years)
- Videotapes of 23 teams working together on task
- Video-recalls of 23 teams regarding the shared regulation of the learning process

Microcodes: Statement units

- Statement units, defined as a codable unit of speech (i.e., a word, a phrase, sentence, or sentences) within a turn, are the units of analysis for microcoding
  (Hogan et al., 1999, p. 387)
- Different levels of statements
  - Non substantial: reactions (agreement, neutral) repetitions, digressions
  - Conceptual: presents information about material, rephrases, what has been read
  - Substantial: presents idea, presents rationale

Macrocodes: Episodes

- Episodes as unit of analysis: meaningful interaction, significant shift in the content of the discussion or action

(Jacobs et al., 2003; Veermans & Järvelä, 2004)

- Inquiry-Cycle
- Competent Problem-Solving Model

(Jacobs et al., 2003; Verschaffel et al., 1999)

  - Understanding of the problem
  - Hypothesis
  - Conduct experiment
  - Interpretation of results

Content of episodes

	Total of episodes	Understanding of the problem	Hypothesis	Elaboration of the problem	Interpretation of results	Evaluation of solution	Total: Conduct experiment
without instruction	96	10	4	14	4	1	76
with instruction	80	3	3	1	8	0	69

	Under-standing of instruction	planning of experiment	arranging of material	monitoring time	measuring temperature	difference within material	difference between material	difference in warming
without instruction	0	17	22	5	14	3	1	2
with instruction	15	12	13	1	13	3	6	1

Types of regulation

- Consensual regulation
  - only one speaker contributes substantial statements, the other speaker responds by simply agreeing or repeating the statement
  - Both speakers contribute conceptual statements
- Responsive regulation
  - Both speakers contribute substantial statements
- Elaborative regulation
  - Both speakers contribute substantial statements to the discussion
  - And both make multiple contributions that build on or clarify the other‘s prior statement

(based on Hogan et al., 1999)

Parallel regulation

- Parallel regulation:

Both are pursuing a train of thoughts or actions
Individual regulation of learning
No cooperation / collaboration

Example

SALLY *is arranging the lamps:* so and now we direct the light here.
SIMONE: So in principle, we have to // build houses.
SALLY: No it lights there and it should become warmer there//
SIMONE: And now you have to build a house

Types of regulation during episodes

	Total of episodes	consensual regulation	responsive regulation	elaborative regulation	parallel regulation
without instruction	97	44	25	21	7
with instruction	81	61	10	7	3

	Total of episodes	consensual regulation	responsive regulation	elaborative regulation	parallel regulation
High SRL	40	32	4	3	1
Low SRL	62	28	13	14	**7**
Mixed SRL	76	45	18	11	2

Summary

- Teams with step-by-step instruction and teams who work on a problem-based task can conduct a good experiment and come to valid conclusions
- Step-by-step instructions help children co-regulate their learning.
- Step-by-step instructions do not guarantee the correct execution of the experiment, nor do they guarantee a correct understanding of the problem.
- With a problem-based task there are more discussions about the meaning of the task – but there might also be more parallel regulation.

Further directions

- Analysis of more videotapes is necessary: Verify preliminary findings and hypotheses
- Include other variables: Individual differences in goals, pre-existing knowledge, classroom practices
- Include video-recall and compare to findings about the learning process
- Quantitative study using several different tasks and including more children

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