



**Situational
interest in
geology
learning:**



Palacký University
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**What learning strategies
promote student interest in
geological topics?**

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Multidisciplinary approach



- physics, chemistry, biology, mathematical models
- economy, geography, etc.

**Why learn
and teach
geology?**

Environmental potential

- Evolution of ecosystems
- geohazards
- climate change



It can be interesting, amazing, funny for students/teachers but...

Not too much because for students geology is

Do students have a positive attitude towards geology?

... difficult to understand spatio-temporal relations

(e.g. *King, 2012; Cheek et al. 2017; Remmen, K. B. and Frøyland, 2020*)

... links with chemistry and physics.

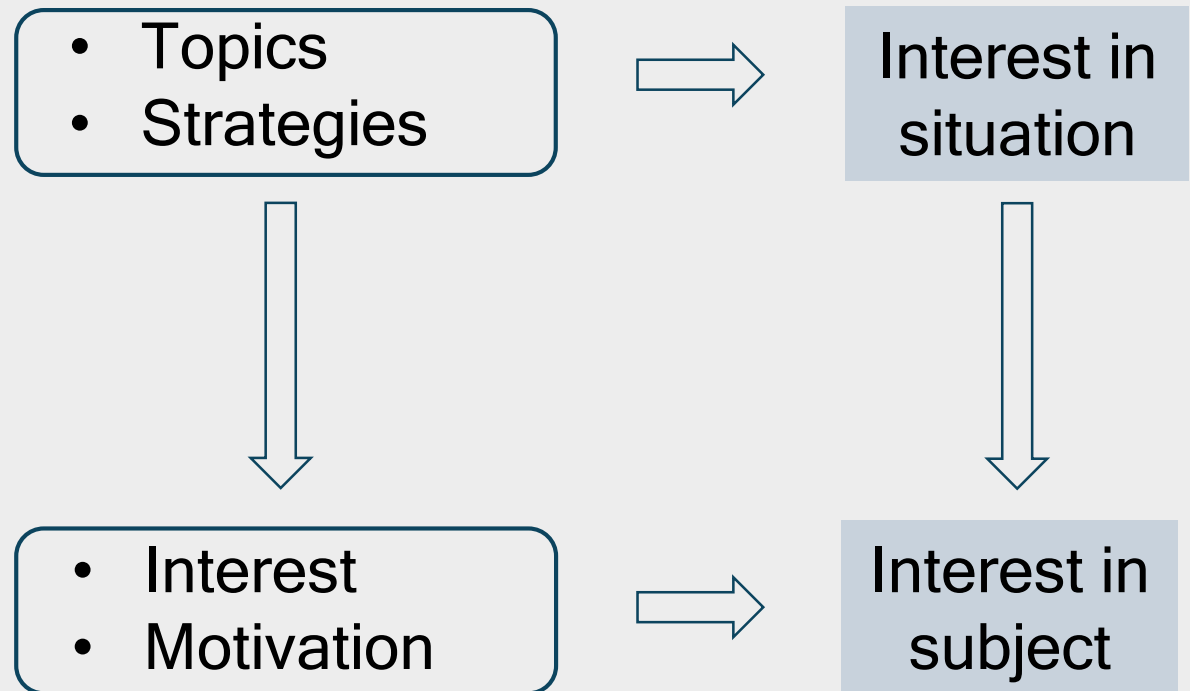
(e.g. *Gilbert et al., 2012; Mills et al., 2020*)

... far from everyday life.

(e.g. *Gilbert et al., 2012; Mills et al., 2020*)

What does a teacher need „to get students on his/her side“?

Can we change that?

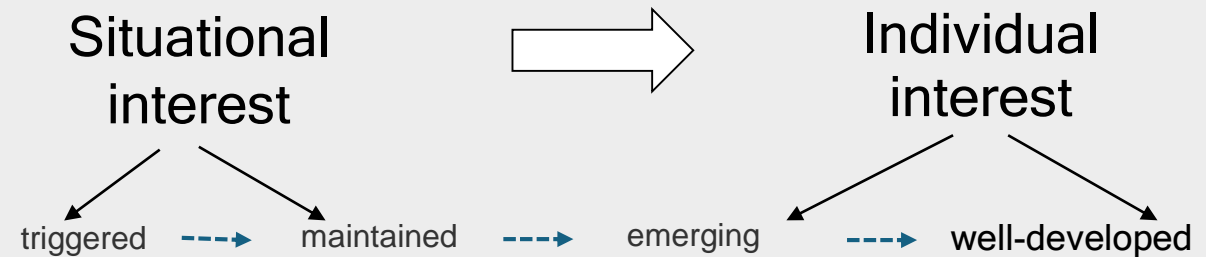




The four-phase model of interest development

(Hidi, S., & Renninger, K. A., 2006)

Situational interest



Situational interest in real lesson

Lesson plan

The main topic of the lesson

- How do geologists learn about the structure and history of the Earth?

The most important learning aim

- The student will be able to identify and use different methods to describe different geological objects and phenomena
- procedural and epistemic level

Lesson plan

Situational interest in real lesson

Focus of learning tasks

- Rock formation and properties
- Geological processes and structures in the landscape
- Time in geology- relative ages of rocks
- Time in geology- absolute timing

Learning strategies

- Observations
- Geological sketch of observed structures
- Modelling of geological structures
- Inductive-deductive methods



What were the students doing in class?

**Situational
interest in
real lesson**

1. ROCK OBSERVATION Working with a rock samples

- What can you observe? Notice all the features and details.
- Describe everything you can observe.
- From which features can you infer how the rock was formed?



2. MODELLING OF GEOLOGICAL STRUCTURES

Modelling with plasticine

- The image shows an interesting geological structure. Can you name it?
- Use plasticine to model the structure you see in the picture.
- Describe any geological processes that may have leading to its present form and put them in sequential order.





What were the students doing in class?

**Situational
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3. FOSSILS

Group discussion

- What can all fossils be?
- What effect does time have on the formation and preservation of fossils?
- Why do we find fossils in some rocks and not in others?



4. RELATIVE AGE OF ROCKS DETERMINED FROM FOSSILS

Working with fossils and stratigraphic chart

- How old are these fossils? Identify the fossils and the period of their occurrence. Rank them from oldest to youngest fossil using the stratigraphic chart.



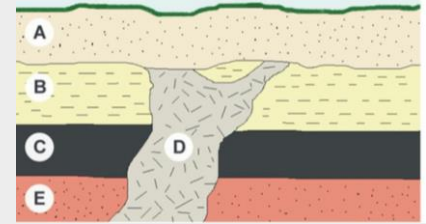


What were the students doing in class?

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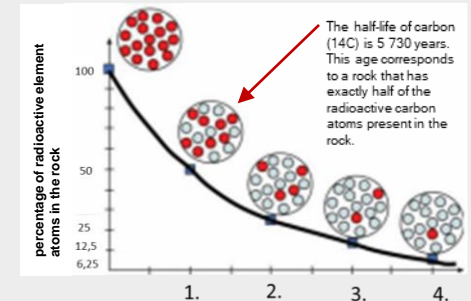
5. GEOLOGICAL PRINCIPLES Group discussion

- See a picture of a sequence of rock layers. Guess which layers are the oldest and which are the youngest and explain why.
- How old is the body of rock labelled „D“?



6. ABSOLUTE DATING OF ROCKS Group working, calculation of the absolute age of the rock

- Numerical task: Radiometric measurements have shown that exactly 25 % of the radioactive carbon nuclei are present in rock A (the half-life of carbon isotope is 5 730 years)? How old is this rock?



We were interested in development of situational interest

Why?

Main question

- Will students show increased interest in geological topics if we offer them interesting content and active learning strategies?

Who?

Participants

- 168 Year 9 students from three low secondary schools in two years
- one lesson - 120 minutes

How?

Research instrument

- Open-ended student responses - feedback on the lesson
- categorizing and coding student responses based on grounded theory



Assessment categories of student interest identified in their open-ended responses

Students' interest in the geology learning

Learning topic

- Rock formation and properties
- Geological processes and structures in the landscape
- Time in geology- relative ages of rocks
- Time in geology- absolute timing

Learning strategy

- Observations
- Geological sketch of observed structures
- Modelling of geological structures
- Inductive-deductive methods

Learning environment

- Time consumption of the learning activity
- Teaching style
- Teacher's personality
- Students' relationship to geology



Students' interest in geological learning topics

What did the students find interesting?

Categories	Concepts	Relative frequency of student interest ratings in relation to the concept (%)		
		Positive attitude	Negative attitude	Neutral attitude
Learning topic	Rock formation and properties	74.1	2.2	23.3
	Geological processes and structures in the landscape	66.7	1.1	32.2
	Time in geology- relative ages of rocks	63.3	4.4	32.2
	Time in geology- absolute timing	51.1	10.0	38.9



Students' interest in geological learning strategies

What did the students find interesting?

Categories	Concepts	Relative frequency of student interest ratings in relation to the concept (%)		
		Positive attitude	Negative attitude	Neutral attitude
Learning strategy	Observations	81.1	2.2	16.7
	Geological sketch of observed structures	73.3	1.1	25.6
	Modelling of geological structures	84.4	2.2	13.3
	Inductive-deductive methods	61.1	1.1	37.8



Learning environment

What else
influenced
the students'
interest?

Category	Concepts	Relative frequency of occurrence in student responses (%)		
		total	Of which positively evaluated	Of which negatively evaluated
Learning environment	Time consumption of the learning activity	7.8	0	7.8
	Learning content	23.2	11.1	12.2
	Teaching style	12.2	12.2	0
	Teacher's personality	3.3	3.3	0
	Students' relationship to geology	12.3	0	12.3

Interesting learning situation created...

What most influenced the students' situational interest?

Topics	LEARNING	
	Activities	Environments
Rocks structures, fossils, time evolution of geological structures	Observation, modelling	Group work, discussion, communication with the teachers

Selected open-ended responses from students' feedbacks

- ✓ *I don't like geology, but looking at rocks and drawing them was fun.*
- ✓ *The best part was the plasticine!*
- ✓ *Working with the stratigraphic chart and fossils made me understand how geologic age is determined.*
- ✓ *I enjoyed everything!*
- x *Geology is not for me.*
- x *I was bored counting the half life.*



Highlights

- Positive acceptance of hands-on strategies
 - rock observation
 - modelling of geology structures

- Understanding geological phenomena through problem-solving
 - spatio-temporal evolution of geology structures
 - age of fossils and relative dating

- Difficulty of abstract topics
 - half timing and absolute dating in geology

- The importance of the learning environment and pedagogical skills
 - time management
 - active learning
 - teacher's personality and teaching style



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