University of Applied Sciences and Arts
Northwestern Switzerland

Formative Assessment Methods for Inquiry Learning

Regula Grob, Monika Holmeier, Peter Labudde

Introduction

Formative assessment has the purpose of assisting learning and for that reason is also called ‘assessment for learning’.

It involves processes of seeking and interpreting evidence
for use by learners and their teachers
to decide where the learners are in their learning and
where they need to go and how best to get there.

Assessment Reform Group 2002

Aims of this paper

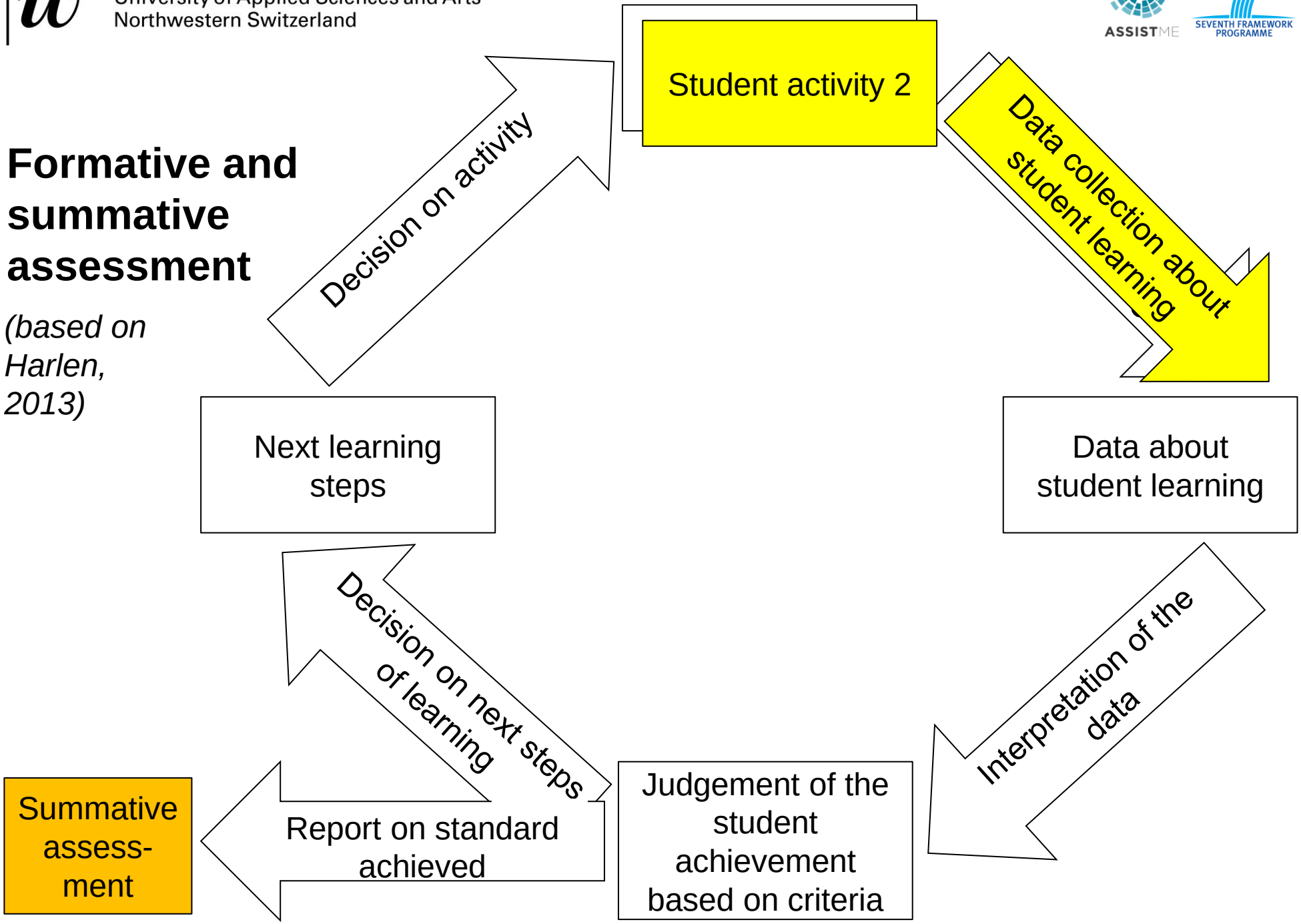
- Link concept of formative assessment with concrete methods
- Select formative assessment methods and competences for trial in inquiry-based education in different European cultures
- Inspire teachers with examples of formative assessment in inquiry-based education for different subjects, school levels, and European countries

Content

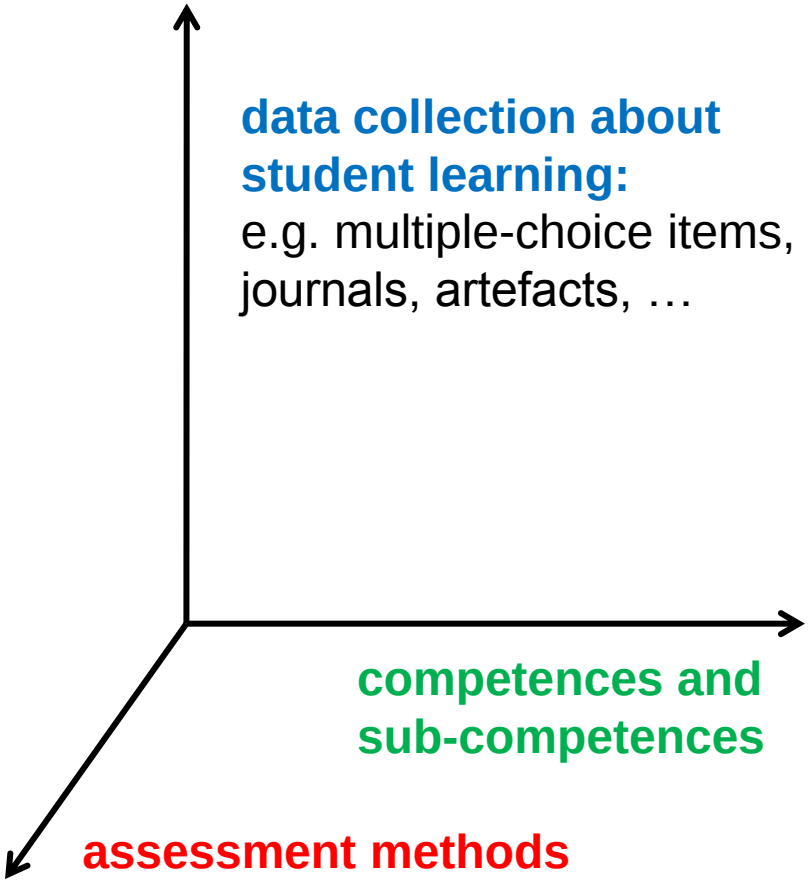
- Introduction
- Connecting the concept of formative assessment with concrete methods
- Illustrating the methods with paradigmatic examples
- Interactive part
- Conclusion and prospects

Formative and summative assessment

(based on Harlen, 2013)



Organisation of the materials developed



- Teachers chose – depending on their unit – a suitable combination of competences / sub-competences, data and assessment method
- Paradigmatic examples were developed for illustration

Four assessment methods

- On the fly *(e.g. Ruiz-Primo & Furtak, 2006)*
- Marking provided by the teacher:
  - formative use of assessment rubric *(e.g. Smit & Birri, 2014)* and
  - written comments *(e.g. Black & Harrison, 2004)*
- Self- and peer-assessment *(e.g. Black & Harrison, 2004)*
- Structured classroom dialogues *(Christensen, 2004)*

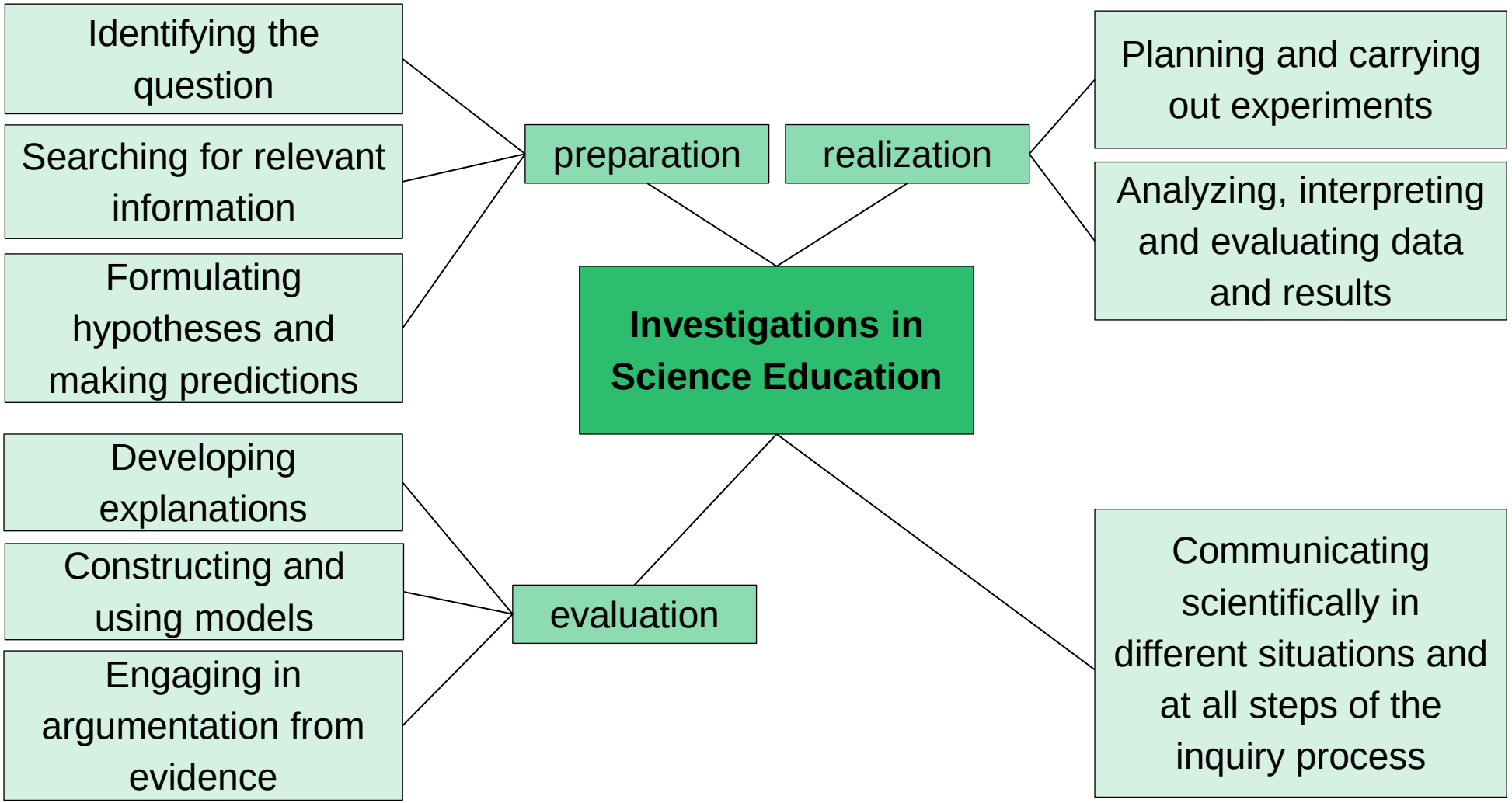
Six competences

1) **Investigations** in Science education
2) **Problem solving** in Mathematics education
3) **Design** in Technology education

4) **Argumentation** (in all subject areas))
5) **Modeling** (in all subject areas)
6) **Innovation** (in all subject areas)

→ **Sub-competences for each of the competences**

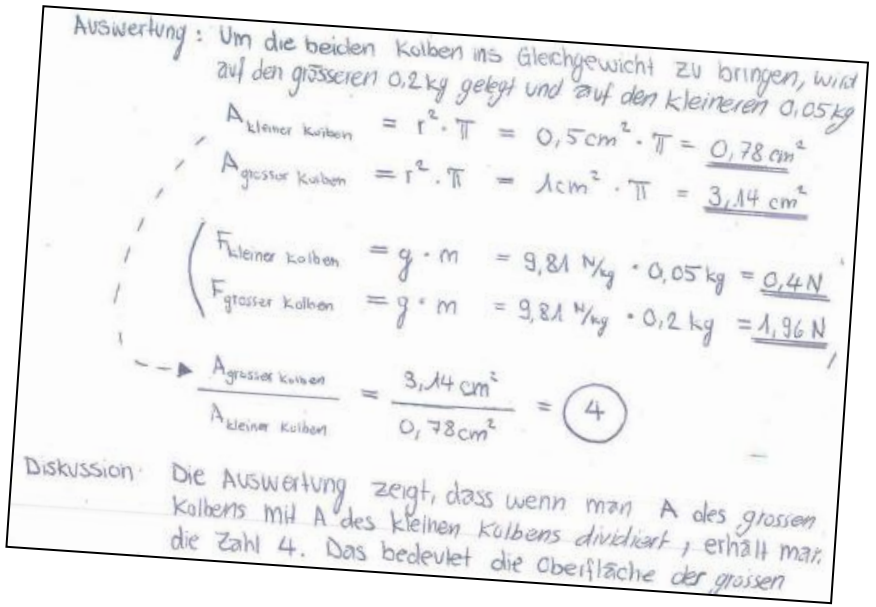
Investigations in Science Education



Content

- Introduction
- Connecting the concept of formative assessment with concrete methods
- Illustrating the methods with paradigmatic examples
- Interactive part
- Conclusion and prospects

Paradigmatic example in Physics


Auswertung: Um die beiden Kolben ins Gleichgewicht zu bringen, wird auf den grösseren 0,2 kg gelegt und auf den kleineren 0,05 kg

$A_{\text{kleiner Kolben}} = r^2 \cdot \pi = 0{,}5\,cm^2 \cdot \pi = 0{,}78\,cm^2$

$A_{\text{grosser Kolben}} = r^2 \cdot \pi = 1\,cm^2 \cdot \pi = 3{,}14\,cm^2$

$F_{\text{kleiner Kolben}} = g \cdot m = 9{,}81\,N/kg \cdot 0{,}05\,kg = 0{,}4\,N$

$F_{\text{grosser Kolben}} = g \cdot m = 9{,}81\,N/kg \cdot 0{,}2\,kg = 1{,}96\,N$

$\frac{A_{\text{grosser Kolben}}}{A_{\text{kleiner Kolben}}} = \frac{3{,}14\,cm^2}{0{,}78\,cm^2} = 4$

Diskussion: Die Auswertung zeigt, dass wenn man A des grossen Kolbens mit A des kleinen Kolbens dividiert, erhält man die Zahl 4. Das bedeutet die Oberfläche der grossen

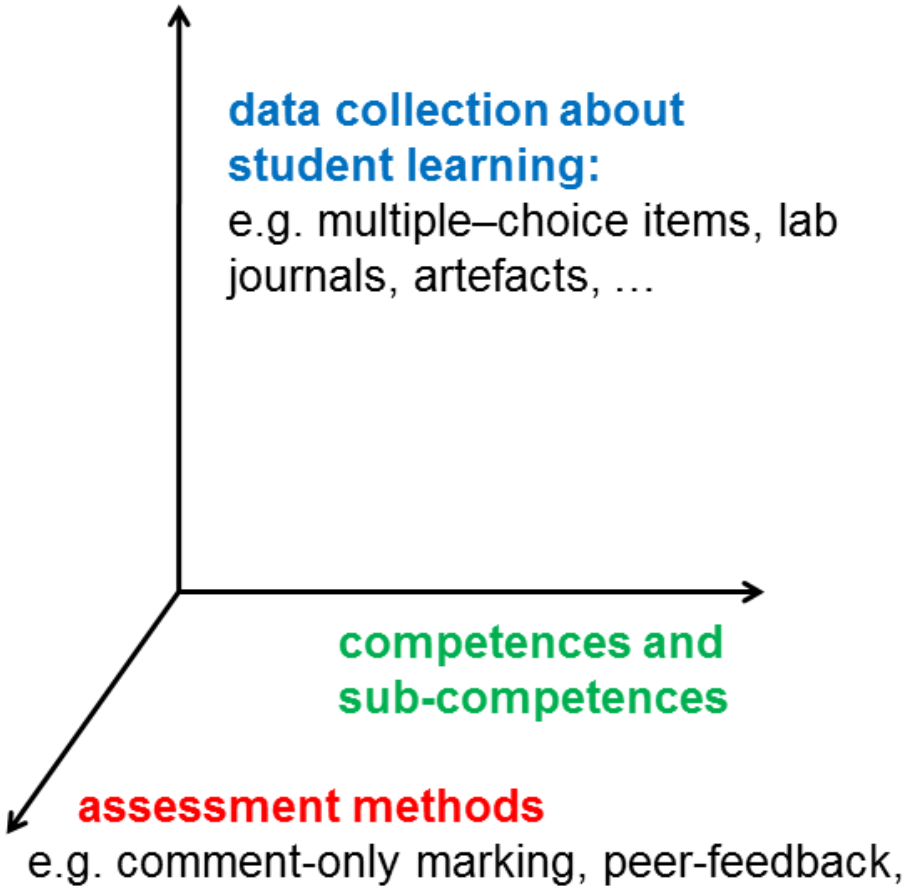
- Students try to prove an already known law
- Measurement results are documented in lab journals
- Work is interrupted; students exchange lab journals with peers
- Peers provide feedback structured by guidelines: on documentation (labelling and organization of measurment data) as well as on experimental design (usability of data to prove the law, …)
- Students consider feedback and continue data collection

Paradigmatic example in Physics (II)

- **Competence and sub – competences:**
  Investigations in Science education / Planning and carrying out experiments

- **Data about student learning:**
  lab journal

- **Assessment method:**
  Peer - feedback



Interactive part

How would teachers in your country react, if you showed them the example of formative assessment in inquiry-based education that was just introduced?

- What would advantages and problems would they foresee?
- How would they adapt or change the example before using it in the classrooom?

Please discuss with the person sitting next to you (4’).

Conclusion and prospects

- Connection between concept of formative assessment with concrete methods
- Selection of formative assessment methods and competences
- Examples that provide inspiration for teachers on how to do formative assessment in inquiry-based education in different subjects, school levels, and European countries
- Trial of the assessment methods in inquiry-based education in different eduational cultures → following papers

Thank you!

ASSIST-ME: Assess Inquiry in Science, Technology and Mathematics Education www.assistme.ku.dk

regula.grob@fhnw.ch

monika.holmeier@fhnw.ch

peter.labudde@fhnw.ch