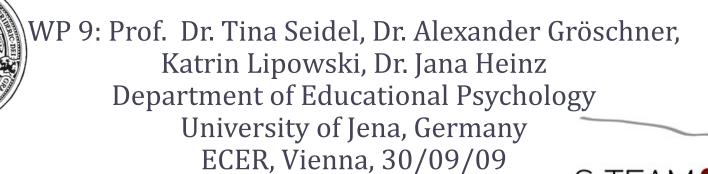
Inquiry-based science teaching across
Europe – How can we develop indicators
and instruments to measure diverse
approaches in science teacher education?

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Work package 9 of S-TEAM will...

- identify indicators for pupil attitudes and motivation in science, and scientific literacy.
- *identify instruments* to measure the efficiency and efficacy of existing science teaching practices and teacher educators
- carry out surveys and evaluations to monitor the success of project deliverables
- promote the formative application of the above indicators and instruments
- identify ways of measuring collaboration between teachers in science education



As the contributions emphasize...

- Research on inquiry-based science teaching cannot provide an indicator's toolbox and say "take what you want, go, and measure"
- It is a qualitative feature of teacher education and professional development in the recent years to be able to show (and to develop) effective ways of teaching and innovative methods



Development of indicators & instruments depends on – at least – 2 questions

What are we searching for?

How do we look at?

#1: We have to be aware of the selective process of measurement!



Levels to set indicators/instruments

Levels	Target grop
administration/state policy	stakeholders
teacher education (in-service)	teachers, teacher educators
teacher education (pre-service)	teacher students, teacher educators
classroom practice	teachers, students
student achievement	students

#2: It is difficult to address all levels for assessment: i) IBST is culturally diverse, an "open conception" (G.K.) and ii) we lack indicators and instruments ready to be used across Europe.

Contributions:

- show diversity of the field
- meet diversity with special interests, knowledge, and instruments
 - Michel Grangeat: "Effects of teaching approaches on learning outcomes: the role of metacognition in developing indicators"
 - Peter Gray/Geir Karlsen: "Evidence, quality and relevance in educational research: the S-TEAM project"
 - Allen Blake/Jim McNally: "The indicators of becoming an effective science teacher: Inquiract and SCEPSATI"
 - Peter Gray: "S-TEAM Theory and evidence in a European pedagogical field"



Shared & different aspects

- Grangeat: intervention (and mirror)
 - "Metacognition" as a wide concept of knowledge about individuals, tasks, and strategies
 - shows important features of classroom conditions: scaffolding students and initiate students' self-regulated learning
 - But specific tasks are necessary as well as specific learning settings (IBST)
- Karlsen: mirror
 - leads to a relevant critical dimension of "evidence-based" ed research
 - IBST as "open concept", situational focus of teaching: "Living indicators" (G.K.)?
 - we need to be critical already on the stage of developing indicators/instr.
- Blake/McNally: intervention (and mirror)
 - go in medias res on an instrument level, they provide a graphic flowchart for (beginning) teachers and a questionnaire for students that gives an opinionbased feedback with regard to the quality of classroom processes
- Gray mirror
 - presents the chances and challenges for S-TEAM on a level of stimulating interest in sciences, confounding factors, dissemination strategies
 - "inquiry" as pedagogical method?



The platform of contributions raise questions

- How can we compare/assess cultural diversity of teaching across Europe if we take into account diversity of teaching, lessons, students, beliefs etc.?
- How can we develop indicators as useful, but also critical mirrors of science teacher education?
- How can we initiate a "learning cycle" with regard to IBST on different levels of indicators & with different target groups?
- How can we initiate an ongoing process of mirroring,
 e.g. in further projects?



S-TEAM as a framework...

- shows cultural diversity of European science teacher education
- brings diverse approaches and science teachers' culture in dialogue
- creates corridors for collaborative activities (on IBST)
- accompanies activities with a wide range of qualitative and quantitative assessment approaches
- can learn from good and less good practices in the educational field, and also assessment practices
- should look for further ways to keep teams/ persons/ institutions in touch

Starting point of searching useful indicators for formative assessment: An example to measure teachers' professional development: 5 core features

1. Content focus:

Teachers' knowledge & skills, improvement in practice, (student achievment)

2. Active learning

Engagment of teachers: observation, feedbacks, discussions

Coherence

- Consistency of teacher learning with teachers' knowledge & beliefs
- Consistency of teacher learning with policies, reforms etc.

4. Duration

Span of time of activity / numbers of hours spent for activity

5. Collective participation

Potential interaction & discourse



Thank you very much!

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