

# 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 group
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 opinion-based 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 achievement)

## 2. Active learning

- Engagment of teachers: observation, feedbacks, discussions

## 3. 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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