# Module Booklet for

# DECoSTE Observation Tool - DOT

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This document is based on the work in the project *Designing and Enacting Coherent Science Teacher Education – DECoSTE*. The project was funded by Erasmus+, Grant Agreement No. 2020-1-DE03-KA201-077542.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

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# Description of the Tool

## Background information

The DECoSTE Observation Tool (DOT) is based on a mobile webapp. The app features a stopwatch and variable number of assignable buttons that can be toggled on and off. The app then keeps track of the times the buttons were on and can produce a timeline based on the times.

The app was initially developed for streamlining data collection in video-based research by making it possible to code, in real-time, observable events in the classroom. Aim was to address the challenges of data selection, time management, and field notes. Later it was seen as a way to introduce research practices into teacher training by applying the real-time coding of observations in pre-service teachers' (PSTs) practical training with the aim of activating and guiding peer observations.

For the DECoSTE project, this idea was expanded further with the observations planned together with reflective tasks. The activities to observe are based on the characteristics of coherent science instruction and as part of the reflection, the PSTs observe each other's practice lesson using the app. The goal for using the app is threefold. First, it guides the PSTs to plan lessons according to the principles of coherent science instruction. Second it activates and guides PSTs what to observe in each other's lessons. Finally, the timeline makes it visible what coherent science instruction activities there were in the lesson. The timeline serves as basis for post-lesson reflective discussion, giving structure to the reflection and helps focus on action. Overall, the tool supports PSTs' plan-teach-reflect cycles.

The DECoSTE Observation Tool is the designed button labels and the instructions for the use presented here. The tool can be accessed from the DECoSTE web-page: www.decoste-project.eu/

## Link to Coherent Science Instruction

The button labels and what the PST's are guided to observe reflect the views of coherent science instruction. In a coherent science instruction, the students are guided to make sense of science phenomena through engaging students in scientific practices and supporting "need-to-know" feeling as described in Figure 1.

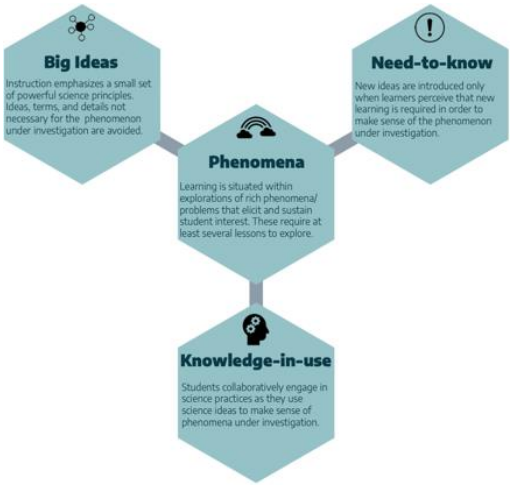


Figure 1. Characteristics of coherent science instruction

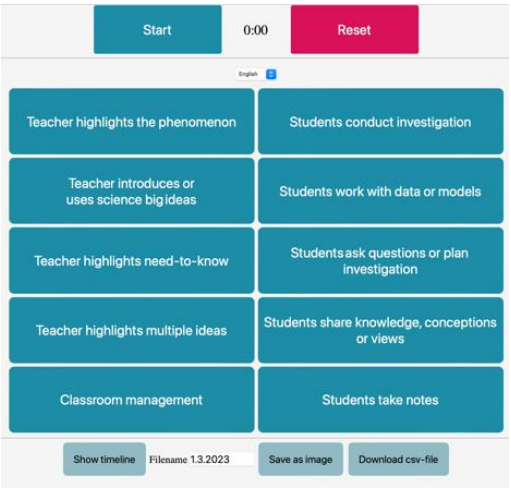


Figure 2. The DECoSTE Observation Tool.

Figure 2 shows the tool with the designed labels and Table 1 introduces the rationale behind each label. In the tool each line corresponds with one of the characteristics of coherent science instruction with one additional line for classroom management. The action buttons on the left-hand side are for the teacher led activities and similarly on the right-hand side are the student activities.

| line | Button | Coherence Core |
|---|---|---|
| 1 | Teacher highlights the phenomenon | **Phenomenon** Teacher shows demonstration, video, describes or refers to phenomenon that students are aimed to make sense of (anchoring event in project-based learning) |
| 1 | Students conduct investigation | **Phenomenon** Students are conducting investigation, watching video, making observations or engaged in some other kind of activity where science phenomenon is present. |
| 2 | Teacher introduces or uses science big ideas | **Big ideas / knowledge-in-use)** teacher introduces conceptual knowledge, uses or construct model**,** evaluate students' learning (initiation-response-evaluation sequences) |
| 2 | Students work with data or models | **Knowledge-in-use** to build model, construct explanation, argument, solve problems, make prediction, computational etc. |
| 3 | Teacher highlights need-to-know | **Need-to-know** Teacher triggers interest, maintain interest, emphasises future or personal relevance, foster motivation, driving question (in PBL) |
| 3 | Students ask questions or plan investigation | **Need-to-know** Student asks scientific questions, plan investigations or tasks. |
| 4 | Teacher highlights multiple ideas | **knowledge-in-use** Teacher emphasizes students' views, historical models, compelling models, describe how different people experience, perceive understand the phenomenon or use knowledge |
| 4 | Students share knowledge, conceptions or views | **knowledge-In-use (Students' ideas)** Students share their preconception, views everyday experiences, how they perceive, model, or comprehend the issue, i.e., use their knowledge. |
| 5 | Classroom management | Teacher gives instructions for assignments, introducing the process or something else e.g., disciplinary. |
| 5 | Students take notes | (C**ore ideas)** Students take notes, listen instructions or do something else that do not emphases their active thinking or own responsibility to learn. |

Table 1. Rationale behind the buttons in Observation Tool.

## Possible Integration into the Teacher Education Curriculum

The DOT can be integrated into the teacher education curriculum as part of pre-service teachers practical training (practicum). During the practical training the PSTs observe and code each other's lesson in pairs (see below) and save and share the timeline produced by the app. Before practicum or lesson observation PSTs should prepare and practice using the tool. Similarly, mentoring teachers should be made aware of the tool and what the buttons stand for.

The observation tasks and the timelines can be used to facilitate reflective discussions with the mentor teachers after the practice lessons. Another possibility is to have a reflective task with the university lecturers at the faculty. Please see the instructor materials for reflection-for-action and reflection-on-action.

The video at University of Helsinki Unitube demonstrates this:

https://www.helsinki.fi/fi/unitube/video/58799e6c-b6b8-4791-8357-9f279fdf0251

## Use of the DOT during a lesson

In the beginning of the lesson, the Start-button is pushed. This starts the recording of actions. In the case an activity, mentioned in the activity button, is observed, the button is pushed. When the activity ends, the button is pushed once again. A teacher-led and student-led activity could happen at the same time. Moreover, a couple of students- or teacher-led activities could happen at the same time. Therefore, a new button could be pushed although the recording of the started activity is not yet ended.

After the observed activities are recorded with the observation tool, a timeline button is pushed. Timeline graph (Figure3) provides a starting point to the analysis of the recorded lesson or reflection. The lesson could be analysed independently, with a mentor teacher, with peer students or with the teacher educator from the faculty. One possible idea is to go together with several student teachers and university teacher to one lesson and record the actions in the lesson. During the reflective discussion, it is possible to share experiences that happened during the lesson, how the activities were connected to each other (e.g. how often teacher refers to the phenomenon, driving question etc.). It is also interesting to analyse and compare teacher's and students' activities. Especially, it would be interesting to reflect the activities that appeared at the same time. Further, it is important to compare the timeline graph with CoRe-tool, inquiry-tool, and storyline tool outputs. Students' are invited to consider, in what extent teacher is active, student is active, how classroom interaction appear, etc. Based on the reflection, student teacher refines the future plans.

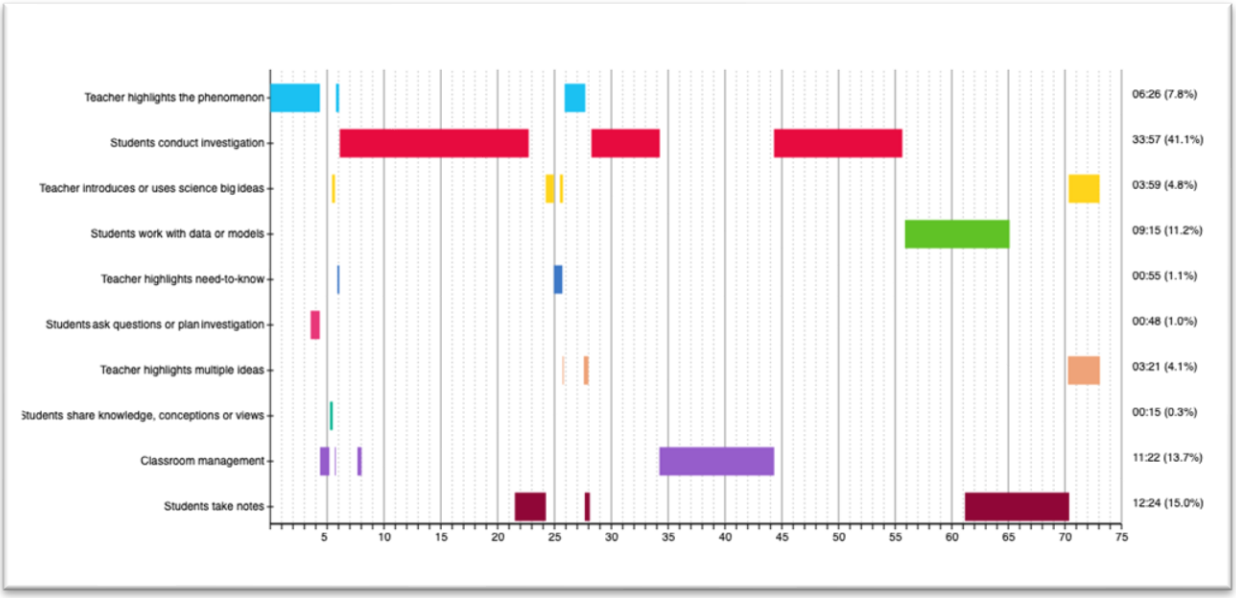


Figure 3. An example of the recorded activities during a lesson.

## Difficulties of Pre-Service Teachers

Although the use of the app is quite straightforward, Pre-Service Teachers might have difficulties with the high number of buttons or internalising all the meanings behind each label. Scaffolding the use of the app with simpler observation tasks could be beneficial before the more sophisticated observations. For example, the number of buttons could be reduced, especially in the beginning or when the observation tool is practiced first time.

In the case, the focus is on students' actions in coherent science instruction the buttons could be:

- Students make sense of the phenomena (students investigate the phenomena)
- student work with the core idea/ideas
- need to know is in focus
- student use knowledge

In the case a classroom interaction is analysed, the buttons could be:

- teacher presentation
- teacher ask a questions
- teacher clarifies students' ideas (conceptions)

- student ask a question
- student interaction in a small group
- no interaction

In the case scientific practices are analysed, the buttons could be:

- asking questions
- planning and carrying out investigations
- analysing and interpreting data
- developing and using models
- using mathematics thinking
- developing explanations
- engaging in argument from evidence; and
- communicating information

Another possibility is to design the button labels and the meaning behind those labels together with the PSTs. This will make easier for the PSTs to internalise the meanings and reduce the cognitive load of the observation task. This can also be used to adapt the tool for the local teacher education curriculum.

## Suggested Activities for Introduction

For introducing the DOT and active observations there are two suggested activities. Either a pre task with discussion at the faculty or a more comprehensive workshop at the faculty. It is also possible combine the two tasks.

### Pre task

Before the use of the observation tool, core ideas of coherent science instruction are introduced to student teachers for example, through integrated coherence ideas to teacher education methods course or through the use of web-based tutorial. Awareness that certain aspects will be observed during the teaching practice may influence on student teachers' lesson planning. It is expected that students will focus more on core ideas of coherent science instruction.

While the observation tool is introduced, the students are provided with:

- Written Description of all buttons of the observation tool with literature references. Connected with coherence core.
- technical introduction how to use the tool
- [these issues are possible to introduce in lectures or use teaching time]
- video recorded introduction of the tool

There are two short videos from Finnish [with English subtitles] classroom:

https://www2.helsinki.fi/fi/unitube/video/322868b6-3486-4985-90f9-28e6574e6ce8

Alternatively, videos from the TIMSS Video Study (http://www.timssvideo.com/) could be used.

Students' task is to apply the observation tool (code the video with observation tool). Students save the graph and bring it with them for discussion at the faculty.

### Workshop at the faculty

The observation tool could be introduced through analysing a video recorded lesson. For example form the The TIMSS Video Study (http://www.timssvideo.com/). An appropriate video could be the AU4 Energy Transfer (http://www.timssvideo.com/au4-energy-transfer). Alternatively, use of the observation tool could be introduced also during a microteaching session. In a microteaching session a student teacher plans and organize a short teaching situation and his/her peers simulate students in the classroom. The use of Observation Tool could follow following schedule:

Plenary discussion:
- Discussion of topics to observe (tool buttons). How the buttons are understood.

YouTube video or microteaching session:
- Student cord the events with the Observation Tool.

Small group activity
- Students show their graphs and discuss similarities and differences in their observations.
- How well the buttons seemed to fit in instruction.
- Preparation of a short report about the three most interesting findings (and propose of one sequence to watch again.

Plenary discussion:
- Groups report their findings. Watching together one or two sequence from the video
- Discussion of reliability of this kind of coding.
- Discussion of aspects that increase coherence in science instruction.

# Instructor Materials

## Reflection-for-action

Reflection-for-action is thinking about future actions with the intention of improving or changing a practice. This type of reflection requires student teachers to anticipate what will occur during a lesson, as well as reflect on their past experiences, before a lesson occurs. After the lesson plan has outlined a prediction to the timeline graph could be prepared by thinking what a teacher and what a student might do in different time of the lesson according to lesson plan. This graph helps student teacher in his/her reflection for action.

## Reflection-on-action

Reflection on action is the retrospective contemplation or analysis of practice in order to cover the knowledge used in particular situations, by analysing and interpreting the information recalled. While using the observation tool, the timeline graph helps the recalling.

When a student teacher is teaching a lesson, there are several possibilities to make the recording. The most common is that a peer student record one teaching practice lesson with the observation tool. It is also possible that several student teachers observe the lesson. It could be agreed that the university teacher also join the observation activity.

After the lesson the student teacher and perhaps also the mentor teacher and peer student start to reflect the lesson with looking the graph. In typical situation, lesson reflection session will start with looking graph(s).

Guiding prompts for student teacher to reflect:

- How does this graph look like?
- what aspect student will focus without any scaffolding.
- Is there anything strange, recognize obvious mistakes in coding.
- Compare with your lesson plan.
- For many PSTs, it is very difficult to estimate time use.
- For example, see how much time was spent to giving instructions, students use for taking notes, how much time used for lecturing etc.
- Let’s see what aspects are coded to co-occurred (this is key for coherence!)
- How phenomenon, big idea, need-to-know, and knowledge-in-use as well as multiple voices are integrated in teaching.
- Student teacher is guided to reflect the connection and how these could be connected better in the lesson.
- What would you do differently in the next lesson, why?

- Idea to think future lessons and how build coherence (and increase student's active thinking and responsibility of their own learning)
- At the end, remind that there is no one "correct" way to organize these things in the lesson and name couple of successes in the lesson.
- Lesson reflection continues for more specific or personal issues as mentor teacher see appropriate.