Confirmatory Inquiry

In Inquiry-based Learning (IBL) the simplest level is the **confirmation inquiry** in which students are provided with the question and procedure (method) as well as the results, which are known in advance. Here the teacher guides the inquiry process by providing all the necessary information and tools and the student executes. Teachers provide guidance throughout the whole process and direct the students to the correct decisions and actions. Confirmation inquiry is useful when a teacher's goal is to reinforce a previously introduced idea; to introduce students to the experience of conducting investigations; or to have students practice a specific inquiry skill, such as collecting and recording data.

In confirmation inquiry the teacher has the absolute control over every phase, making all the decisions and the students execute. For example, the teacher decides on the topic, creates the hypotheses, makes predictions, decides upon the research and analysis method and tools, guides the discussion and decides on the presentation strategy, audience, format and so on. The students perform the activities.

The microclimate scenario

The scenario used to show case the weSPOT IBL model is a scenario within a secondary education context, about microclimates (Mikroyannidis, Okada et al. 2013). Microclimates are areas where the normal temperature and conditions are slightly different from the surrounding areas. The aim of this scenario is to find the best place to have a bench at the school. The initial hypothesis is that the best place is the garden site nearest the school entrance because it is sheltered from the wind but south facing, so it is warm and not windy there. Other places to be considered are the car park, the canteen, the games area and the reception.

The scientific questions proposed by the teacher are:

- *Where is the windiest part of the school grounds?*
- *Where is the sunniest part of the school? This is likely to be the warmest.*
- *Where will we find the warmest part of the school grounds?* (Mikroyannidis, Okada et al. 2013).

Therefore, the inquiry is based on four measurements: speed of wind, sunny periods, temperature and humidity.

Phase 1 - Question or hypothesis. At this phase the students are given the specific question or hypothesis by the teacher. The teacher is the one who defines the field of research (e.g. Microclimate) provide all the supplementary materials and explanations, such as what microclimate is, definitions, additional resources etc. He/she is the one who will decide if there is a need to cover all the sub phases of the IBL model. The aim of the model is provide guidance by showing to the teacher aspects of research/inquiry that might be of importance and value. Some example specific questions that the students will work on can be the following:

- *What are the energy sources in the classroom?*
- *What quantity of energy do they consume?*
- *Is there a relation between external climate and energy consumption?*
- *How long is the air-conditioner working during the day and at what temperature?*
- *What measures could be taken to minimize the energy consumption (e.g. do not open windows, do not leave the door open during breaks, do not switch the light on during the day, etc.)* (Mikroyannidis, Okada et al. 2013).

Phase 2 - Operationalisation. At the stage of operationalisation the teacher introduces the method, decides what information they need, how they can collect it and what needs to be measured, how it will be measured, decide on specific indicators and make prediction. Some of the activities can be the following:

- *To measure the temperature inside and outside three times a day (morning, midday and evening).*
- *To compare the temperature in the classroom and outside the building.*
- *To check during the measurement if the window or the door are open.*
- *To watch external climate conditions (sunny, windy, rainy etc.)*
- *To check when the air-conditioner is on and off.*
- *To calculate the energy consumption of the air-conditioner.*
- *To search the web for the most efficient way of use of the air-conditioner they have in the classroom.*
- *To check how often the lights are on and off.*
- *To calculate the energy consumption of the lights.*
- *To check how long the sunlight is enough during the day.*
- *To make informal questionnaires with their parents and relatives about how they save energy* (Mikroyannidis, Okada et al. 2013).

Some of the subtasks maybe excluded from the processes because they do not fit the scope of the specific topic, for example in the microclimate example the teacher can decide that at the operationalisation stage the ethical aspects are not important and therefore do not take them into consideration. The reflection will also be guided by the teacher and can either be self-reflection or group reflection.

Phase 3 – Data collection. At this phase students collect the data it has chosen to measure by using the appropriate method and the appropriate tools, for example by taking pictures of the appropriate places that the bench can be placed or record measurements of temperature and/or wind speed, and store their data in a secure and safe way. However, the teacher decides on the tools that they have to use to take measurements, for example in this scenario, smartphones,

thermometers, anemometer etc., where to store the data (e.g. database, computer etc.). Reflection at this phase might be reduced since most of the decisions are made by the teacher however the students can talk about their measurements and by doing so they reflect upon them.

Phase 4 – Data analysis. At the data analysis phase the students analyse the collected data by using the appropriate method and tools. The teachers decide the type of analysis that the students will perform, qualitative or quantitative, on the tools to be use, for example excel, SPSS etc. The students using the tools they prepare diagrams and graphics based on the temperature and wind measurements, and identify relations between different factors influencing their decision about the best place to place the bench (temperature, wind speed, sunny intervals etc.). The teacher will exclude the invalid data to reduce the noise of the data. Reflection at this step is very similar to the reflection described in the phase above.

Phase 5 – Interpretation/Discussion. The teachers draw conclusions based on the students' data analysis, related to the hypothesis and discuss different decisions and results. He/she decides on the relevance of their results, their significance, and they place them within the appropriate research field, microclimate, by comparing them to other existing works. The teacher then can guide the students to make a decision or he can make the decision for them. On the basis of final decisions the students prepare a list with suggestions such as:

- *The best place to put the bench is the garden.*
- *The best place to put the bench is the south garden.*
- *The best place to put the bench is by the gym.*

Phase 6 – Communication. The students prepare their presentations, conclusions and recommendations, and give arguments (data, tables, diagrams, pictures), decide on how to disseminate the results. However the teacher informs them and decides about their audience is it going to be their fellow students' teachers, parents etc., and the tools they need to use for the presentation. Different audiences may require different types of communication. For example, for the microclimate scenario the teacher decides that the audience will be the fellow students and the appropriate tools to use is a PowerPoint presentation or a report. If it is a PowerPoint presentation the teacher will guide them through the preparation. They decide on the tools they need to use and how can incorporate the feedback they might got from the fellow students or peers. Throughout this phase reflection is at the centre scrutinising every single step or decision the students have made and guided by the teacher. Each team or student then makes its presentation in front of the fellow students and receive feedback.