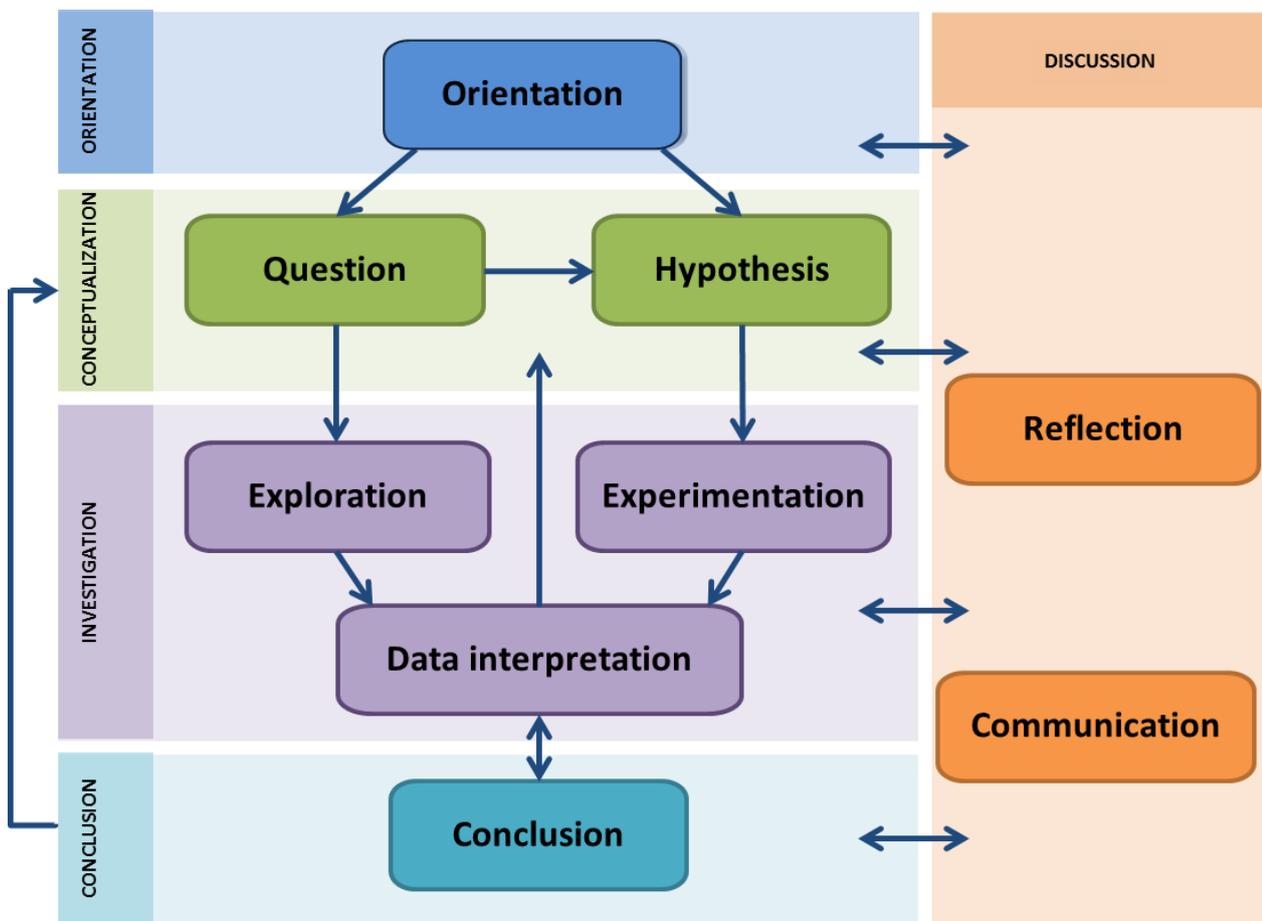


Guide for the organization of an Inquiry Learning Space according to Go-Lab inquiry cycle designed to combine in-class teaching with the use of online labs.

The Go-Lab Inquiry Cycle

The Go-Lab Inquiry Cycle is graphically presented in the following image. The contributor of an inquiry learning space can choose to follow different inquiry pathways, as defined by the arrows in the image, depending on the level of complexity of the activity she/he plans to create.





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The three main possible inquiry pathways are indicated with arrows as seen in the image above:

- a) Orientation—Question—Exploration—Data Interpretation—Conclusion;
- b) Orientation—Hypothesis—Experimentation—Data Interpretation—Conclusion; and
- c) Orientation—Question—Hypothesis—Experimentation—Data Interpretation—Conclusion.

The “Discussion” phase can be seen as a process that is “optional” in the inquiry cycle, while in the individual learning process inquiry outcomes can be reached without any discussion. However, the quality of the whole inquiry and related learning gain can depend on the discussions in each inquiry phase and/or after completing all other phases.

About the lesson plan

Please provide some general information about your lesson plan.

Title:

Brief Description:

Subject Domain:

Keywords:

Language:

Age Range:

Didactical Hours:

Educational Objectives (Types of knowledge):

Factual *(please elaborate)*

Conceptual *(please elaborate)*

Procedural *(please elaborate)*

Meta-cognitive *(please elaborate)*

*You may remove any types of knowledge are not covered by your lesson plan



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Orientation

Orientation is focused on stimulating students' interest and curiosity towards the problem at hand. During this phase the learning topic is introduced by the environment or given by the teacher or defined by the learner. In the Orientation phase the main variables of the subject at hand are identified.

Introduce the topic by adding materials like for example videos, photos or images that the students can use in order to familiarize themselves with the problem at hand.

Conceptualization

Conceptualization is a process of understanding a concept or concepts connected to the problem that has been presented. It is divided into two (alternative) sub-phases, Question and Hypothesis whose outcomes have similar components.

Encourage your students to identify all the concepts that are related to the problem under discussion and make the correct connections between them.

Tip: Do not point out any mistakes students might make. Students are supposed to discover these mistakes themselves and correct them. Alternatively, you may note them down and bring them back to their attention at a later stage.

Sub-phase 1: Question

Question is a process of generating research questions based on the stated problem. After the students have identified all the related concepts guide them to formulate their questions on the subject.

Sub-phase 2: Hypothesis

Hypothesis is a process of generating hypotheses on the stated problem based on theoretical justification. After the students have identified all the related concepts guide them to make specific hypotheses which they will later set out to investigate.

Tip: Do not point out any mistakes students might make. Students are supposed to discover these mistakes themselves and correct them. Alternatively, you may note them down and bring them back to their attention at a later stage.



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Investigation

Investigation is where curiosity is turned into action in order to respond to a stated research question or hypothesis. Students design plans for experiments, investigate by changing variable values, explore (observe), make predictions, and interpret outcomes. Investigation has three-sub phases; Exploration, Experimentation and Data Interpretation. In this phase the teacher must introduce the on-line the students are going to use.

Sub-phase 1: Exploration

Exploration is a systematic way of carrying out data manipulation with the intention to find indications for a relation between the variables involved. In Exploration there is no specific expectation of the outcome of the data manipulation and it naturally follows the Question phase.

Encourage your students to propose ways to explore the questions they have set. After the students have made their proposals encourage them to explore them and try to retrieve information. Additionally introduce to them the lab that has been selected for this activity and ask them to use it in order to retrieve more data during their exploration.

Sub-phase 2: Experimentation

Experimentation concentrates on developing and applying a plan for a data manipulation with a specific expectation of the outcome in mind and naturally follows the Hypothesis sub-phase.

Encourage your students to make an investigation plan in order to investigate the hypotheses they have set. Ask them what kind of tools they will need to deploy and what parameters they will have to investigate. Introduce to them the lab that has been selected for this activity and ask them to build their investigation around it.

After the students have completed their investigation plan ask them to put it in action so as to collect their data.

Tip: Make sure students understand the connection between the investigation and the hypotheses they have made. In other words make sure they understand why they are doing every single step.



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Students also have the tendency to change variables in a uncoordinated way. Guide them so as to make their investigation as systematic as possible by changing only one variable at a time and by keeping notes not only for their data but also about the process itself.

Sub-phase 3: Data interpretation

Data interpretation is needed to make meaning out of collected data and synthesizing new knowledge. Guide your students to manipulate the data they have collected. Ask them to propose ways on how they may make use of their data. Propose to them different options like making graphs, deploying mathematical equations and formulas. You may also guide your students to check and make use of the relative theory.

Conclusion

Conclusion is a phase for drawing the basic conclusions based on the data that have been collected and processed during the investigation that was carried out. In this phase learners address their original research questions or hypotheses and consider whether these are answered or supported by the outcomes of their investigation. It leads to new theoretical insights – a more specific idea is created on the relation between variables (following Question) or whether the hypothesis is supported by the results of the study (following Hypothesis).

Guide your students to draw their conclusions and ask them to compare them to their original hypothesis. If the students had made any mistakes in the previous stages, make sure you bring them back to their attention so as to correct them. Depending on the activity you might also need to ask your students to compare their findings with the respective bibliography or theoretical values.

Discussion

Discussion is about sharing one's inquiry process and results. It involves the process of describing, critiquing, evaluating and discussing the whole inquiry process or a specific phase. In each step of the inquiry cycle, generate a discussion by asking questions so as to stimulate your students and provoke their curiosity.

Sub-phase 1: Communication

Communication can be seen as the process where students present and communicate their inquiry findings and conclusions, while listening to others and articulating their own understandings. Encourage your students to put together a report which will describe every step of their experimentation. The report does not necessarily have to be an essay-type



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report. Encourage your students to come-up with creative ways to communicate their work. For example they can do a small video out of it, a prezi, a PowerPoint presentation or a poster like those presented by scientists during conferences.

Sub-phase 2: Reflection

Reflection is defined as the process of reflecting on the success of inquiry while proposing new problems for a new inquiry and suggesting how the inquiry process could be improved. Reflection is also defined as receiving feedback from students themselves, teachers or peers so as to improve this (sub-)phase or the whole inquiry process in a next trial. Both Discussion sub-phases can be seen at two levels – discuss or reflect the whole process at the end of the inquiry or in relation to every other phase during the inquiry.

Generate a discussion among the students to talk about their results. Try to identify alternative explanations and point out the strong and weak points of their work. Encourage the students to propose corrective moves and refinements of the experimentation process.