The ODL MOOC
guidelines

All different scenarios for microMOOCs are laboratory-based experiences and should have a high degree of interactivity. Their duration must be limited approximately to 20-30 minutes, inclusive of the exploitation of the remote/virtual labs. The key role in making successful the proposed teaching strategy is played by the choice of the topic and of the learning environment in the microMOOC. What piques student’s curiosity will depend on the student’s interests, experience and prior knowledge.

A “good” microMOOC topic to be used in a class, should:

1. provide affective engagement to the students;
2. generate curiosity and leads to questions;
3. generate a cognitive conflict;
4. be scientifically investigated and explained within the competence of the students involved;
5. create scientific knowledge;
6. require the students to use inquiry skills to explain the involved phenomena;
7. be faced in a limited span of time (1–2 lessons

In order to develop scientific knowledge and stimulate the strengthening of reasoning skills, the students will be engaged into inquiry-based learning environments in identifying scientifically relevant questions, planning investigations, gathering data and evidences in laboratory and/or real-life situations, building descriptions and explicative models, sharing their findings and eventually addressing new questions that may arise. All phases of the 5E cycle model should be included into the microMOOC, but with different amount of support provided by the teacher. Moreover, the five phases of the learning process should be well separated within the microMOOC in such a way that their administration, could also be delayed in time.

Take a look at 3 different templates

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Scenario 1: ***Basic approach*** (Confirmation Inquiry)
Main student outcomes: Practical applications of the theory.

In the basic approach, the teacher provides students with the question, shows the use of the remote/virtual lab, illustrates the procedure and the method, but the results and their explanation are known in advance. Confirmation Inquiry is useful when the teacher purpose is to reinforce a previously introduced idea, introduce students to the experience of conducting investigations, or have students practice a specific inquiry skill, such as the collecting and recording of data.

In this case the microMOOC topic will be previously introduced by the teacher and explained in depth; the novelty will be represented by its contextualization in real-life environments (Engage). The virtual or remote laboratories will be exploited by the teacher (Exploration). All other phases (Explanations, Extention, Evaluation) are faced and discussed by the teacher in the microMOOC. After the microMOOC vision, the students have the possibility to explore the remote/virtual experiments in class (in small groups working with tablets connected to the internet), or at home. They will be invited to write a scientific report on the experience done and on acquired concepts.

Scenario 2: ***Intermediate approach*** (Structured/Guided Inquiry)

Main student outcomes: Practical applications of the theory; reasoning efforts to generate explanations on the basis of their own investigation results.

In the structured inquiry level, the question and the detailed procedure for the utilization of the remote/virtual lab are provided by the teacher. However, the students generate an explanation supported by the evidence they have collected by experiencing the remote/virtual lab by themselves. They are responsible for uncovering the answer. The teacher acts as a knowledge facilitator, providing support or materials in the microMOOC so that the students can experience a sense of success when working at this level.

Also in this case the microMOOC topic will be previously introduced by the teacher. Because this kind of inquiry is more involving than the first level, it is most successful when students have numerous opportunities to learn and practice different ways to plan experiments and record data. Therefore, after the microMOOC vision, the students should have the possibility to repeat the experiments (in class or at home) by changing the parameters. They will be invited to write a scientific report on the experience done and on acquired concepts.

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Scenario 3: ***Advanced approach***
(Elicited/Open Inquiry)

Main student outcomes: Through self-designed or stimulated exploration students make hypotheses, test their own predictions, and draw their own conclusions; they should reach higher levels of autonomy and develop higher-order thinking skills.

In the Open inquiry the teacher takes the delicate role of defining the context for inquiry by presenting a multidisciplinary view of a theoretical problem or a real-life phenomenon. Subsequently, he/she stimulates the students to define their relevant questions, design and carry out their independent investigations, construct coherent explanations, communicate and share their results. An open inquiry-based instruction seems more efficient to reinforce learners' reasoning skills, also increasing the awareness of the process of scientific inquiry. Despite this, students involved in open inquiry may develop feelings of frustration due to the lack of achieving the desired goals independently from teacher's hints.

In the Elicited/Open inquiry level, within the microMOOC the teacher will provide students with only the research question, stimulating the learners to explore the potentialities of the remote/virtual lab by themselves. Here, the students design the procedure (method) to be followed in the use of the remote/virtual labs, record and interpret data, test their questions and share the findings. Although teachers are less instructive, they provide a framework (scaffolding) for the process when needed, prepare resource lists or help cards in order to help students to manage this level of inquiry. The students by mean of the microMOOC will be involved in a learning path with a specific process of activation — Elicited Inquiry—, consisting of a learning environment in which the instructor actively will participate to the debate on the physics governing the observed experimental findings, never providing exhaustive explanations to the students, but giving comments and hints, sometimes expressly incorrect, always leaving the students in a state of uncertainty, stimulating their reasoning and activating their scientific inquiry.

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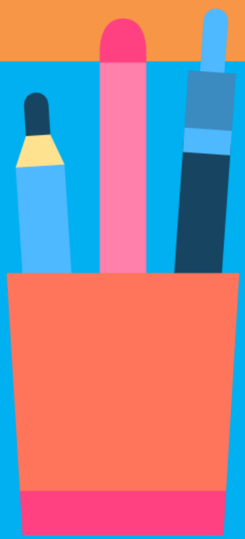
(i) **Engage** state involves the setting of the learning environment in a way that piques student interest and generates curiosity in the topic under study. It get students personally involved in the lesson, while pre-assessing prior understanding. During the ENGAGE stage, students first encounter and identify the instructional task, make connections between past and present learning experiences, setting the organizational ground work for upcoming activities. The video format should arouse students' curiosity and encourage them to ask their own questions;

(ii) in the **Exploration** stage, by means of the remote/virtual labs, the students have the opportunity to get directly involved with phenomena and materials. The teacher acts as a facilitator, providing materials and guiding the students' focus. **Explore** is the beginning of student involvement in inquiry. They search for information, raise questions, develop hypotheses to test, collect data;

(iii) **Explanation** involves the process of data acquisition and evidence processing techniques for the individual groups or entire class (depending on the nature of investigation) from the information collected during the exploration. **Explain** is the stage at which students build models (descriptive or explicative), discuss their data with peers and the teacher and begin to communicate what they have learned;

(v) **Evaluate** is an on-going diagnostic process for both students and teachers. It involves students' capacity to make judgments, analyses, and evaluations of their work, also in comparison with the work of their colleagues. It also allows teachers to determine how much learning and understanding has taken place.

(iv) **Extend** is the stage in which students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways, building possible generalizations;



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