




Training in the Laboratory Going Virtual or Being On-site | How to Decide

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On behalf of



On behalf of the Federal Government of Germany, the Physikalisch-Technische Bundesanstalt promotes the improvement of the framework conditions for economic, social and environmentally friendly action and thus supports the development of quality infrastructure.



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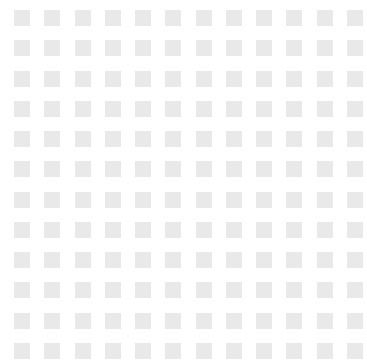
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A General Overview for Project Coordinators and Technical Experts

Capacity development processes and individual trainings (including hands-on laboratory trainings) can be organized on site, virtually or as a hybrid combination of the two.

The PTB Working Group Capacity Development has implemented a pilot project conducting **virtual** hands-on laboratory training. In this document, we would like to share our experience with you and inform you about some helpful resources that we have compiled on the basis of the pilot. Find out our answers to the following questions:



Why should I choose virtual or hybrid capacity development processes or trainings?

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What are the main differences and similarities between on-site and virtual hands-on laboratory training?

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What do I need to consider when implementing capacity development processes and training in virtual (and hybrid) mode?

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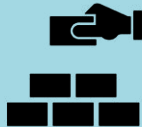
What are the main take-away points in a nutshell? What further resources and support are available to me?

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1. Why Should I Choose Virtual or Hybrid Capacity Development Processes or Trainings?

Increased impact

Virtual tools allow for a larger group of trainees, more reaction time for responding to on-site circumstances, and more efficient follow-up on tasks and developments during or after the intervention.



Sustainable knowledge management

Presentations, formats, surveys, documents, tasks, etc., of a capacity development process or training can be maintained and archived on a learning platform, so that they can be easily reused or adapted later as individual elements, a training module or a specific capacity-development (sub-)process.



Smooth integration

Virtual trainings are easier to integrate into everyday work schedules, compared to *classic* workshops, as they are split into several sessions of about 1–3 hours, spread over a period of time.



Easy access and planet-friendly

Participants can join from anywhere in the world (internet access provided), even if the country's security situation is not allowing travel.



Unnecessary travel is avoided and the carbon footprint of the project is reduced.

Flexible learning and teaching

Online live trainings can be combined with asynchronous self-study sessions.



In the time between live sessions, participants can apply and deepen what they have learned. Trainers have time to react flexibly to needs identified during the training.



Virtual mode, however, does not always make sense. There are also reasons to advise against doing trainings virtually, for example, because of:

- consistently **poor internet connection** and no alternative solutions can be found (e.g. purchasing internet/data plans), data security concerns, overly complex logistics, etc.;
- a high need to **maintain contact and build trust** with partners;
- **insufficient knowledge** or unfamiliarity with local conditions
- **highly complex technical requirements** and laboratory techniques.

In such circumstances on-site and hybrid activities are preferable over purely virtual measures.

2. What are the Main Differences between On-site and Virtual Hands-on Laboratory Training?

The table below provides a quick comparison of the main differences between on-site and virtual training.

	On-site training 	Virtual training 
Trainer and participants	Present in the same place and at the same time	Connected online, at the same time or at different times
Schedule*	Usually several consecutive full days	Short live sessions, complemented by asynchronous self-study periods
Media	Presentations (projector) Whiteboard, flipchart, pinboard	Presentations (screen-sharing) Virtual whiteboards and other tools
Lab demonstrations	Live presentation on devices	Video presentations (live or pre-recorded)
Group work	Live in <i>real</i> groups	In virtual breakout rooms

* As an orientation, a training course that takes five full days on site can usually be implemented virtually in maximum 10 weeks with training sessions of 2–3 hours each.

The table below presents in greater detail the differences between the two modes of training as well as the respective advantages and disadvantages of each.

	On-site training	Virtual training
Duration	<p>Compressed schedule: Several full days in a row</p> <p>Pro: Trainees dedicate their full time and attention to the course in the allocated time</p> <p>Pro: Trainees do not need to plan time outside of the training to complete exercises and practice laboratory procedures</p> <p>Con: Can be difficult for trainees to take several days off from regular work to participate in the training</p>	<p>Extended schedule: Sessions of 2–3 hours each spread over several weeks</p> <p>Pro: Easier to integrate into daily work</p> <p>Con: Trainees can underestimate the amount of time that they need to invest in asynchronous work in between sessions and not complete the assignments</p> <p>Con: The longer the training is stretched out over time, the higher the likelihood of trainees dropping out and not completing the training</p>
Trainers	<ul style="list-style-type: none"> • Technical skills • Pedagogical skills 	<ul style="list-style-type: none"> • Technical skills • Pedagogical skills • Online collaboration skills: familiarity with additional tools (e.g. Moodle, remote desktop control, etc.) and methods for fostering social interaction online • Basic video-shooting and editing skills <p>A team of two trainers with complementary skills (e.g. technical expertise and online collaboration/moderation) can be beneficial. It is also very helpful if one of the trainers is from the region and is familiar with the local culture and circumstances.</p>
Trainees	<p>The number of trainees is limited by the capacity of the laboratory</p> <p>Con: If trainees from different laboratories gather in one for the training, the equipment and setup used in the training might not necessarily be the same as in their own laboratory</p>	<p>Trainees from multiple laboratories can join at the same time</p> <p>Pro: Potentially bigger target group is reached increasing the efficiency of the intervention</p> <p>Pro: Trainees join from their everyday work environment and apply the training to their own laboratory equipment</p>
Preparation: Pre-assessment	<p>Pre-assessment needed to get a sense of the laboratory setup and the trainees' competences</p> <p>Pro: The trainer can improvise on the spot in the laboratory</p> <p>Con: Little time to adjust the training once the trainer is on site or to react if some device or accessory is missing</p>	<p>Pre-assessment needed to get a sense of the laboratory setup and the trainees' competences</p> <p>Pro: Time between sessions allows for flexibility and small incremental adjustments in the course design to better correspond to the level and needs of the trainees; missing devices and equipment can be procured in between sessions</p> <p>Con: Less ability to improvise quick-fix solutions on the spot</p>
Preparation	<ul style="list-style-type: none"> • Conceptualize the training design (what content will be covered and what methods will be used) • Prepare training materials (presentations, exercises, additional resources) 	<p>Same as with on-site training but some additional time is needed to organize logistics prior to the training: agreeing on dates and times for each session with the trainees; choice of livestreaming platform; setting up a Moodle Room; generating login accounts for trainees and uploading materials</p> <p>Some additional time to ensure appropriate virtual tools are integrated in the training methods to facilitate concentration and effectiveness of the training (whiteboards, polls, virtual laboratories)</p>

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	On-site training	Virtual training
Implementation	<p>Live demonstrations of laboratory procedures and techniques</p> <p>Pro: Trainers can observe the practical demonstrations by trainees from beginning to end and are there to immediately comment on errors or answer questions</p> <p>Con: In some cases the procedure is too long to practically be demonstrated in its entirety (e.g. waiting for the ice to freeze in the case of ice point measurement) which results in some idle/underutilized time</p>	<p>Pre-recorded or real-time demonstrations livestreamed online</p> <p>Pro: Trainees practice the procedures on their own equipment in their own labs; at the same time they also can observe other labs and equipment from the other participants</p> <p>Pro: Trainees have to independently manage the procedure on their own and cannot rely on the trainer being next to them (learning by doing)</p> <p>Pro: A learning/practice takes place also in the process of preparing for the live demonstration or for the video recording</p> <p>Con: Preparing a pre-recorded video can be time consuming, especially if trainees are unfamiliar with video editing software</p> <p>Con: In videos, only a selection of the steps is shown; the trainer might miss some mistakes, which were not included in the video or cannot verify the measurements/results. This risk can be mitigated by specifying in advance what the pre-recorded video should include or asking the trainees to perform certain steps in real time via livestream.</p>
	Trainers on site can assign tasks, clarify instructions and answer questions on the spot.	Trainers should budget additional time for communication with trainees (e.g. sending emails with instructions for assignments or answering emails with questions from trainees) and maintaining the Moodle room inbetween sessions (e.g. uploading presentations after each session, sending email reminders with links for live sessions, etc.)
	<p>Theoretical material can be introduced in the morning sessions and practical exercises applying the new material conducted in the afternoon</p> <p>Con: Little time to assimilate the new material or review it on own schedule; can lead to informational overload, fatigue and declining concentration toward the end of the day and in the last day(s) of the training</p>	<p>Different topics can be effectively split into individual sessions</p> <p>Pro: More time to assimilate material between sessions</p> <p>Pro: Optional sessions can be scheduled/reserved in case more time is needed or problems arise in some sessions (e.g. internet/electricity fallout, missing laboratory equipment, etc.)</p> <p>Con: Less can be covered in individual virtual sessions due to screen fatigue, lower attention span online, technical difficulties, <i>check-in</i> time at the beginning of each session; this can be compensated with scheduling additional sessions</p>
Synchronous and asynchronous work	<p>Synchronous work only</p> <p>Pro: Trainer is available on site to immediately answer questions and accompany the learning process</p> <p>Pro: Ensures that trainees will complete the exercises</p> <p>Con: Underutilized time for the trainer while the trainees are completing exercises and other assigned tasks</p> <p>Con: No opportunity for independent review of the material which might facilitate comprehension and retention</p>	<p>Synchronous and asynchronous work</p> <p>Pro: The time in between sessions can be used for independent study, preparation of pre-recorded videos and other homework assignments</p> <p>Pro: Trainer and trainees have more flexibility and control over their schedules; more efficient use of time</p> <p>Con: It might be more difficult to ensure that trainees set aside the time to actually do the offline work</p>

3. What do I Need to Consider when Implementing Capacity Development Processes and Training in Virtual (and Hybrid) Mode?

The use of virtual capacity development processes and trainings in PTB projects **entails rethinking the overall approach** and, if necessary, adjusting the project implementation by PTB, partners, short-term consultants (iKZEs) and experts/trainers. Especially in the initial year(s) of a project, it may be necessary to do some convincing.

For trainers without much prior experience in virtual implementation, an additional month of **preparation time must be included**.

Practical tips

On the PTB learning platform Moodle (<https://quisp-course.de>), there is a training on the use of virtual tools such as a learning management system, pre-recorded videos, virtual laboratories or interaction in virtual training rooms.



On this platform, you can also find a collection of digital training materials on various topics that trainers can use. Before developing training material from scratch (e.g. pre-recorded video on a particular topic), please make sure that there is not already something similar on the platform which can be directly used or modified with minimal effort. This saves time and resources.

If trainers need training on the virtual aspects, please contact the PTB Working Group Capacity Development. The PTB Working Group Capacity Development and an increasing number of experts with experience in virtual collaboration are available to advise and assist during the decision-making, preparation, implementation, and evaluation phases. These opportunities to receive individual targeted support should be taken advantage of.

4. Our Recommendations and Support Resources in a Nutshell

Recommendations

- A thorough pre-assessment should be conducted either as a survey or in a preparatory meeting, to make sure the trainer knows the laboratory conditions and technical competences of the trainees very well.
- The trainer(s) need to have online moderation skills in addition to technical skills. Using appropriate methods is crucial.
- Use a learning platform such as Moodle to upload resources, conduct surveys and quizzes and collect feedback from trainees.
- Design live sessions of max. 3 hours and complement them with independent study material that participants work on in between the live sessions.
- Both trainers and trainees should demonstrate live or in pre-recorded videos how they work on the lab equipment. Do not try to be perfect, as learning from mistakes is crucial.



Helpers

A compendium of working documents for PTB 9.3 staff:

- Checklist with steps for the preparatory and implementation phase
- Example pre-assessment questionnaire
- Example learning platform setup and a pre-recorded video
- Example ToR as well as ToT training material for virtual trainers



Openly accessible resources with practical advice:

- A guideline on virtual hands-on laboratory trainings describes how to set up such a training
- Entries in the CDO navigator on topics related to implementing online events successfully
- Please do not hesitate to contact the PTB Working Group Capacity Development for individual advice and support



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