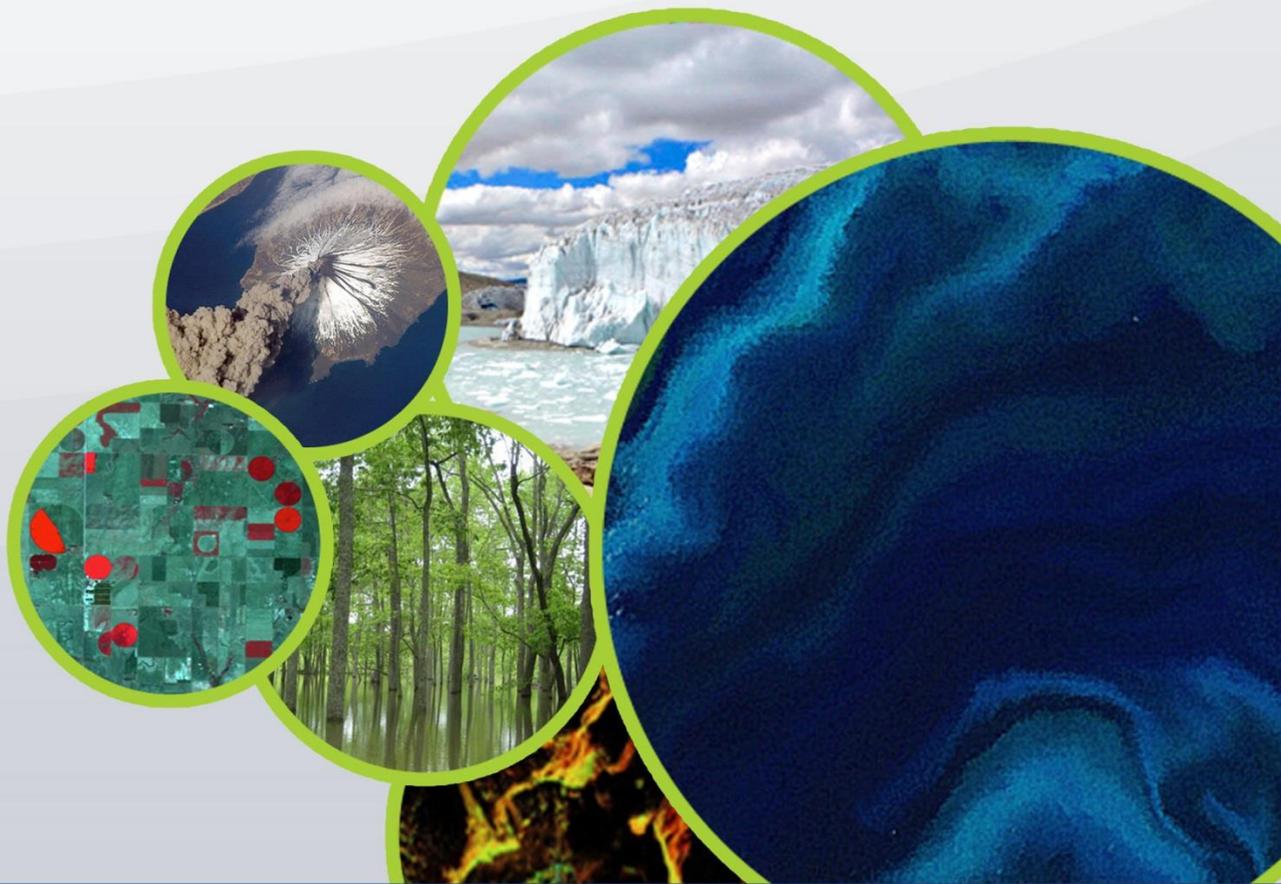




Committee on Earth Observation Satellites



# Training: Methods & Best Practices

CEOS Working Group on Capacity Building & Data Democracy

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## Version Control

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| 0.1       | Lauren Childs & Georgina Crepps (NASA)            | Initial Draft  | Oct 2016 |
| 0.2       | Kim Holloway (CEOS SEO)                           | Removed redundancy, structured using CEOS template                     | Mar 2017 |
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| 1.2       | Senthil Kumar (ISRO)                              | Additional information and suggestions added                           | Nov 2017 |
| 2.0       | Hilcea Ferreira & Claudia Lucaccioni (INPE)       | Incorporated suggestions, added references and feedback survey tips    | Dec 2017 |
| 3.0       | Lauren Childs-Gleason (NASA)                      | Minor reformatting, grammar edits, added/updated post-training actions | Dec 2020 |

## Background

Part of our work as the CEOS Working Group on Capacity Building and Data Democracy (WGCapD) is to raise awareness of the value of Earth observation data products and services and to help user communities access data, products, and tools and effectively apply those data to solve real-world problems.

One of the ways we conduct this work is by organizing and/or participating in targeted, collaborative training opportunities, events, and workshops in partnerships with local, regional, and international stakeholders. Our Working Group members possess a wealth of knowledge and experience conducting these kinds of training and capacity building activities. We also seek to serve as a training/capacity building resource to the CEOS Working Groups and Virtual Constellations who we help to undertake their own capacity building initiatives.

For that reason, we have compiled this CEOS Training Methods and Best Practices Guidelines, which is intended to be a living document, for exchanging experiences and sharing knowledge.

Our training events should include as much information as possible about any relevant and newly launched CEOS Agency missions, instruments, and/or available data to effectively and efficiently utilize the time and money invested by both trainers and participants to attend. They should also build awareness of CEOS EO Data Portals and Software tools.

We invite other CEOS working teams to provide feedback on how these best practices may benefit their training activities and to communicate with us about additional guidelines that may make this document more robust.

The following information provides some best practices and guidelines on training activities in general, using the five phases of the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model (Figure 1), followed by General Tips, Webinar Tips, Summarized Steps for Creating Training Initiatives and Tips for creating Feedback Surveys.



Figure 1. ADDIE Model for training planning (source: Linda Lorenzetti, [http://www.e-adventurer.com/challenges/ADDIE/story\\_html5.html](http://www.e-adventurer.com/challenges/ADDIE/story_html5.html))

## Pre-Training Analysis

### 1. Conduct a **Needs Assessment**.

- Communicate with potential participants who fit the demographic of your target audience about their needs and what kinds of capacity building would best serve them.
- Research the ideal language in which this training should be delivered through site visits, surveys, meetings, videoconferences, etc.

### 2. Define the **main goal** for your training initiative – will this training focus on building **awareness** or **skills**?

- Considerations for **building awareness**:
  - Focus on the Lower Order Thinking Skills – Remember and Understand.
  - A one-day training typically focuses on raising awareness about available resources and includes practical, hands-on activities whenever possible.
- Considerations for **building skills**:
  - Focus on the Higher Order Thinking Skills – Apply, Analyze, Evaluate, Create.
  - Multiple-day training can offer deeper, experiential learning opportunities for analysts and policy makers.
- General considerations:
  - Providing information on theory in the morning and conducting hands-on applications of that theory in the afternoon works well.

### 3. Decide on a **delivery mode** – consider the resources that target participants will have available before deciding which mode is appropriate. For example, access to high-speed internet is often critical for successful online trainings, and not all participants will have the necessary software, internet speed, or appropriate hardware to conduct an onsite training in a computer lab.

- Online / e-Learning (webinar, virtual classroom, MOOC, microlearning, video-based learning, etc.)
- In-person (workshop, training, etc.)
- Hybrid / Blended (combination of online & in-person, broadcast onsite events, etc.)

### 4. Define the **scope** of your training based on stated needs and available resources; confirm the scope is appropriate for the intended audience (by communicating with them).

### 5. Help **focus** the training by defining a **specific topic/theme/application** (e.g. urban planning).

### 6. Consider the depth and breadth of knowledge the attendees can realistically gain through the training to **define training level: introductory to advanced**.

### 7. Clearly define your **target audience**:

- Age
- Gender
- Level of Education
- Professional Experience
- Technical Expertise related to the topics of the training
- Objectives (theirs, not yours)
- How useful would be this training for potential participants?
- How would the knowledge gain be applied?
- Technical Resources/Available Infrastructure

### 8. Determine the maximum **number of participants** allowed to participate:

- Ensure gender balance.
- The number of participants may be limited to the resources at a given training location, or you may choose a training location based on the ability to accommodate the number of people you are training.

9. Determine a **training location** and/or **technology/platform**.

- If Onsite or Blended: Determine a **training location**. Computer labs with technical support at research facilities or with an “educational/training environment” are ideal (as compared to individuals working on their personal computers) and allow for testing software and computer functionality in advance of the training.
- If Online: Ensure the platform/software used can accommodate the **number of participants** you are planning to engage. Also consider the **number of tutors** for providing assistance to students and the nature of course: more theoretical or hands-on.
- Consider options for...
  - The **Learning Management System** (LMS) for dialogue (communication, interactivity and collaboration), placing learning materials, performing assessment activities, grading, feedback etc.
  - **Software** for preparing learning material, listening to videos, animations etc.
  - **Communication platforms** (teleconference, videoconference, webinar etc.)

10. Identify the **length & timing** of your training.

- Consider international holidays
- Where possible leverage existing conference activities, and scheduling trainings before or after conferences that potential attendees may already be attending
- Determine the time requirement in advance of the training to advertise the event, and establish deadlines for participants to complete pre-requisites and registration.

11. Organizers and in-country stakeholders should ensure all communications/marketing efforts specify the background, educational, professional, and other prerequisites required for participants to qualify for this training.

12. Identify parallel initiatives that have offered or will offer similar training in the region to assess joining efforts and avoid duplication of trainings. Coordinate agendas and scopes of work if possible.

## Training Design

Engage stakeholders and identify available resources. Collaborating with other organizations on training allows for joint funding, multi-disciplinary expertise and experience, in-country/local perspectives, broader representation of the remote sensing community, input from aid agencies and universities, etc.

Some considerations:

- **Map and align** – learning objectives and expected outcomes with Learning Activities and Assessment.
- **Training design** – remain focused on the scope of the training and include lectures, discussions, videos, and hands-on activities.
- **Learner-Centric approach** –
  - Incorporate the use of data from the country in which the training takes place, whenever possible.
  - Deliver the training and training materials in whatever language they prefer. If necessary, plan to support language translation during the training and include captions in audio-visual learning materials.

## Training Development

Develop the training materials and where possible explore **co-development** of training materials with leading experts and subject matter experts.

### Develop materials:

- Presentations
- Handouts
- Case Studies
- User Guides
- Hands-on exercises
- Assignments
- Group project (to encourage team work)

### Considerations for developing training materials:

- Avoid long lectures for any kind of training. Instead, consider creative, highly visual, hands-on approaches to delivering content: using varied formats to accommodate different learning styles.
- Online trainings can use videos and exercises to promote engagement and knowledge retention.
- When conducting a series of trainings, consider how each training can expand on the previous one. Providing multi-tiered trainings can enable participants to increase the depth of their knowledge.
- Identify trainers with training experience and expertise in the training topic/theme/application. Approximately one lead trainer per 25 students is ideal, with one to three additional technical support trainers to assist students during hands-on activities. Multiple trainers for various modules may also be beneficial, provided they work together to ensure proper transitions from one module to the next and communicate how their various modules interrelate.
- Market/advertise the training to your target audience, ensuring they are aware of training objectives, prerequisites and time they are expected to dedicate to training.
- Engage trainees in group discussions, interactive sessions as part of active learning.

## Training Implementation

1. Prior to the start of the training, send participants relevant details such as a list of software and hardware requirements and installation procedures, details on timing and location, and schedules or agendas.
2. Publicize the event: mailing lists, social media (Facebook, Twitter, Instagram, CEOS pages).
3. While conducting the training, ensure open lines of communication between trainees and trainers.

Some recommendations on how to address last minute situations (with the understanding that even though all efforts were made to avoid these situations, they may still happen):

- Attendance of participants not suited to take the training, or unexpected participants with no proper background to take training
- Flexibility to cover additional content, per participants request
- Technical issues, such as electricity, internet failure – what are the back-up plans?
- Conduct rules, may something inappropriate happen
- Provide sufficient time for performing tests: software, LMS, videoconference platform, etc.

## Training Evaluation

Survey participants before training events to assess their demographics (location, skill level, career field, etc.) and their current level of understanding, experience, needs, and objectives. This sets the baseline for your evaluation.

Survey participants during training events to allow feedback and mid-course correction.

Survey participants after training events to identify what they've learned to determine if their objectives were met and to solicit feedback on the training itself. Have trainees rate the training materials, the instructors, the delivery channels, etc. Consider using digital survey applications (e.g. Wufoo.com) that can provide decent survey analytics for surveys completed by large numbers of people.

*Appendixes I, II and III present some tips on how to create surveys, for participants and instructors.*

Establish a mechanism (e.g. working group) for providing follow-up support to participants when they return to their institutions to apply their new knowledge and skills.

Prepare a lessons learned and feedback report upon course completion to capture and retain all the issues. Alumni feedback is very useful to learn effectiveness of training undertaken and obtain future course recommendations. Document students' quotes.

Impact Analysis: survey participants again at six months to one year after they've received training to understand how the training may (or may not) have been applied going forward and highlight success stories and any obstacles or knowledge gaps. Keep the participants informed of new developments and technologies, such as data availability from new earth observation satellites, grants, etc.

In post evaluation model, include 'refresher courses' (after duration to 3-5 years) to keep the training efforts alive.

## Post-Training Actions

Post-training communications should focus on the following:

- Conduct the post training evaluation survey.
- Allow trainees to opt-in or opt-out of joining a mailing list to receive information on future training opportunities.
- If not already done, share training materials and files, and other resources for trainees to revisit as interest and timing allows.
- Write up the training report that summarizes the training and any lessons learned while conducting the training.

## General Tips

- A preliminary webinar prior to the training can help ensure attendees come to the training with a common understanding of background information and knowledge. Written materials may also be provided by mail for study in advance of the training in the event that internet access is limited.
- Providing information on theory in the morning and going through hands-on applications of that theory in the afternoon works well.
- Consider providing participants with a certificate/possible certification for completing the training.
- Make course recordings and materials accessible to participants (and possible the general public) once the course is complete. Our Learning Center (<http://learningcenter.obt.inpe.br>) is licensed under a

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(<https://creativecommons.org/licenses/by/4.0/>).

- Share online training content via off-line channels: mail content to interested users on disks/flash drives; make content available online at academic institutions in areas near interested users and identify institutional/local points of contact willing to distribute training materials; consider ways to use smartphone applications to disseminate training content.
- Have contingencies in place for unexpected obstacles/limitations: power failure, interrupted internet access, technical failures, etc. Having a spreadsheet with participants' names, phone numbers and emails might be handy for quick communication.
- Advantages of pre-recorded presentations to be shown during the training:
  - No dependence on internet speed or stability during the presentation
  - Increased quality through some post-production (picture in picture with a screen recording of the presentation in full HD)
  - On demand availability of the presentation
  - May be complemented with a live situation via web conference, skype or chat etc. for Questions & Answers
- Online and Blended Trainings typically have higher rates of students' dropout. Make sure students are clear about how much time they are expected to dedicate to the course and engage them, from the beginning:
  - Send email to all participants with credentials one week before the course starts with clear instructions:
    - Tutorial (step by step) for using LMS
    - Tutorial (step by step) for using videoconference platform
    - Netiquette
    - Course rules and methodology
    - Software, hardware, and internet connectivity requirements
  - Encourage them to interact within LMS and to fill out their profile with information about themselves, including a picture.
  - Keep track of students, contact by email, phone; document absenteeism.
  - Utilize efficient methods for communication during the course.

## Webinar Tips

- Free trainings typically have more people register than actually attend. Therefore, always accept at least 30% more students than you plan to have in the course. This will accommodate the dropout rate usually experienced.
- Set up the time for sessions to allow different time zone participation (one solution is to offer the session at two different times for the Eastern and Western Hemispheres).
- The meeting platform shall be opened for participants 10 minutes prior the webinar.
- Provide clear instructions regarding sessions, rules and netiquette (rules of etiquette when communicating virtually).
- All participants shall be muted by entry to the webinar.
- Cameras should be on at the beginning of the training, it looks more personal, increases social pressure to participate, and then turned off during the session.
- Allow enough time for questions from the audience, which shall be addressed in the chat box when using software with this capability.
- Make your training session more active:
  - Get to know your audience:
    - Conduct a quick investigation by sending a questionnaire before the training.

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- Engage participants during the session by:
  - Having a simplified design of presentation, visual and with an appropriate level of information
  - Introducing content actively
  - Using interactive videos and animated demos (remember to send these material in advance)
  - Using quick polls and surveys during the webinars to prevent participants from losing focus and engaging too heavily in unrelated tasks during the webinars (i.e. multitasking). Polls and surveys also help instructors gauge how well the students are understanding the information (or how much they already know)
  - Presenting lower cognitive questions, yes/no, easy answers
  - Saying their names when answering questions
  - Showing scenarios and engaging participants
- Consider having a person to help the instructor with the chat box.
- Consider having a moderator present in each webinar to help troubleshoot webinar technology without distracting the instructors. The moderator may also manage questions from students during the session.
- Learning is a social activity:
  - Solve problems together
  - More memorable
  - Foster dialogue specially with large audiences
  - Make better actions in the chat box
  - Acknowledge comments, use people's names, link comments, encourage peer-to-peer interaction
- Two-way communication: enable post-webinar interaction: instructors-participants; participants-participants.

## Summary of Training Creation Steps

1. Define the main goal of the training: build awareness or build skills
2. Map and align:
  - Expected learning outcomes
  - Competencies
  - Learning activities
  - Assessment
3. Plan with these pillars in mind:
  - Two-way communication (dialogue)
  - Focus on the learner
  - Match your technology with your goal
  - Hands-on activities to build skills
4. Training evaluation
5. Draft a report capturing lessons learned

## References & Resources

- Molenda, M. In search of the Elusive ADDIE Model. Performance Improvement, v. 42, n. 5, p. 34-37, 2003
- NASA-ARSET. Remote Sensing Training: Methods & Best Practices. NASA's Applied Remote Sensing Training Program. 2016. <<https://arset.gsfc.nasa.gov/all/webinars/best-practices-2016>>.
- Rao and Pang, Designing Development Programs to Build Capacity. 2011. <<http://www.r4d.org/wp-content/uploads/Designing-Development-Programs.pdf>>
- WGCapD Lessons Learned Reports
  - International e-learning course on Introduction to Remote Sensing Technology – 2013
  - Webinar Series - Remote Sensing Technology for Disaster Management Webinars on Disasters - 2015
- WMO Space Programme (Stephan Bojinski<sup>3</sup> provided these materials)
  - Satellite Skills and Knowledge for Operational Meteorologists (WMO guidance document for shaping training activities in support of operational meteorologists. It summarizes skills and knowledge that such personnel should possess to successfully carry out their functions).
  - Training Development Plan (Template)
- WMO-CGMS Virtual Laboratory for Training and Education in Satellite Meteorology (VLab) online session, 2015: Planning and delivering training sessions.

## Appendix I: Feedback Survey – General Tips

Types of Feedback:

1. Anonymous
2. Identified (name or email)

Types of Questions:

1. Multiple Choice - Likert Scale
  - Strongly agree
  - Agree
  - Neutral
  - Disagree
  - Strongly disagree
2. Dichotomous – Yes/No
3. Ranking something in order of preference from best to worst
4. Rating your opinion bases on a scale:
  - Poor
  - Fair
  - Good
  - Very Good
  - Excellent
5. Rating something from 1 to 10
6. Short Answer
7. Long Answer

Possible Survey Sessions:

1. Personal Information (in case not anonymous)
2. Training Organization
3. Experience from participant's perspective

4. Training Expectations
5. Contents
6. About Instructors
7. Assessment and Self-Assessment

## Appendix II: Feedback Survey for Participants (Sample Questions)

### 1. Personal Information (in case not anonymous)

- a. Name
- b. E-mail Address
- c. Institution

### 2. Training Organization

- a. Were you informed in advance about the content of the training and the way it would be organized? (Yes/No)
- b. How did you become aware of this training?
  - Mailing list X, Y, Z...
  - Website
  - Social Media: Facebook, Twitter, Instagram, YouTube, Other
- c. Did the training website meet your needs/expectations? (Yes/No)
- d. The administrative staff has been efficient and solved all the problems that were presented. (Likert Scale)
- e. Do you intend to access materials from the training (presentations, recordings, etc.) after the training is over, on the CEOS WGCapD Learning Center (<http://learningcenter.obt.inpe.br/doku.php?id=workshop-montreal>)? (Yes/No)
- f. Learning objectives, instructional and assessment activities are closely aligned. (Likert Scale) or (Yes/No)
- g. The workload is appropriate. (Likert Scale) or (Yes/No)
- h. The learning material provided facilitates the acquisition of content. (Likert Scale) or (Yes/No)
- i. The hand-on activities made easy the learning process. (Likert Scale) or (Yes/No)

### 3. Overall Experience

- a. I was satisfied with the overall quality of this training. (Likert Scale)
- b. The information presented at the training was useful and relevant to my work. (Likert Scale)
- c. Was this your first online education experience? (Yes/No)
- d. If you have had previous online education experiences, please list any Learning Management Systems (such as Moodle) that were used? (Open)
- e. Which kind of training do you prefer?
  - Online
  - Onsite
- f. How would you rate the Learning Management System used? (Rating Sale).
- g. How would you rate the quality of the session recordings? (Rating Sale).
- h. How would you rate the live webinar sessions given? (Rating Sale).
- i. LMS (Learning Management System) used is intuitive and is easy to navigate throughout the training. (Likert Scale)
- j. The interaction and communication student to student, student to instructor and student to content via LMS were satisfactory. (Likert Scale)
- k. Do you want to make some comments about the training? We will be glad to hear from you... (Open)

### 4. Training Expectations

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- a. This training met my expectations. (Likert Scale)
- b. Your overall rating of this training (Rating Sale).
- c. Suggestions for how to improve this training. (open)
- d. Would you recommend your colleague/ friends to attend the similar training if organized in future? (Open)
- e. Which topics would you recommend to be added to next trainings? (Open)
- f. Do you want to comment on specific aspects of the training such as: topics and issues; scenario-specific comments & suggestions; format and organization; collaboration and coordination or others? We will be glad to hear from you! (Open)

### 5. Contents

- a. How would you rate the training content? (Rating Sale).
- b. Which parts of the training did you find most/least helpful? (Open)
- c. Was the amount of time you spent taking this training appropriate for the amount of information you learned? (Yes/No)
- d. The training objectives were clear. (Likert Scale)

### 6. About Instructors

- a. In general, instructors were well-prepared and clearly presented their ideas. (Likert Scale)
- b. At least one of the instructors said something that led me to think differently about a specific project or initiative on which I am working. (Likert Scale)
- c. How would you rate the instructors? (Rating Scale)
- d. Instructors have deep knowledges of the training subject. (Likert Scale)
- e. Instructors created a positive climate of study. (Likert Scale)

### 7. Assessment and Self-Assessment

- a. How would you rate the assessment tools (X, Y Z..) that have been used? (Rating Scale)
- b. How would you rate the quizzes? (Rating Scale)
- c. Assessment and evaluation goals are clearly communicated and evaluation tools are appropriate for measuring outcomes. (Likert Scale)
- d. Please reflect on your own performance throughout this training. Based on what you have learned, how would you rate/grade your performance on a scale of 1 (Poor) to 10 (Excellent)? (Open)
- e. In case of building skills training: How would you rate your capability of applying what you have learned? (Rating Scale)

## Appendix III: Feedback Survey for Instructors (Sample Questions)

### Personal Information

- Full Name
- E-mail address
- Institution

### 2. Training Organization

- Were you informed in advance about contents and organization? (Yes/No)
- Were you well informed about your commitment as an instructor? (Yes/No)
- Was the training website complete? (Yes/No)

### 3. Online Experience

- Was this your first online experience? (Yes/No)

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- In case you answered “NO” before, what LMS was used? (Open)
- How did you get along technically with [insert name here] LMS? (Open)
- How did you get along technically with [insert name here] Communication Platform? (Open)
- Are you comfortable with the idea of teaching a training outside of the traditional classroom without daily/weekly face-to-face interaction between students and instructors? (Yes/No)
- How would you compare the online experience to other face-to-face trainings you have taught? (Open)

4. Overall Evaluation

- Did you have to dedicate more time for class preparation and students’ follow-up than you expected? (Yes/No)
- Would you like to participate in the next edition of this training? (Yes/No)
- What is your overall impression of the Training? (Open)