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WEATHER CLIMATE WATER

Seasonal Climate Forecast

COURSE PACKAGE T.O.P.
Theory and Operational Principles

ETR-22



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Background

Since 2014, the Istituto di Biometeorologia (IBIMET) and the Consiglio Nazionale delle Ricerche (CNR) within the activities of the Regional Training Centre (RTC) in Italy, have been offering a series of highly successful and innovative courses on the uses of seasonal climate forecasts for the Mediterranean region. These courses used a blended learning format to increase their scope and increase the time for practical applications during the workshop phase, and preserve the course resources for access by participants on its Moodle platform.

On 23 November 2016, IBIMET-CNR signed a letter of Agreement to develop a Course Package on Applications of Seasonal Climate Forecasts for adaptation by other WMO RTCs.

The project goal is to further extend the reach of the courses on seasonal forecasting by creating a course package on Seasonal Climate Forecasting that could be used and adapted by RTCs in all WMO Regions.

This activity is intended to be the initial phase of a larger effort, to start in 2017 under a separate funding agreement that will involve additional RTCs in regions such as RA I, RA II and RA V serving developing countries. This activity will address WMO Strategic Objectives 5 and 6, in particular:

- 5 (b): Review and replicate in other regions the model for the upcoming MedCOF, Rome, Italy, which combines the COF with the blended-learning course on seasonal climate prediction)
- 6 (a): Provide guidance to regional training centres on WMO priority area course designs - contents, learning outcomes, learning activities, assessment methods, resources, etc.

The “course package” should include annotated lectures and reading resources. Laboratory, best cases or other learning exercise descriptions and content to be used as-is or as templates to implement regionally adapted exercises. Selected additional external resources/links where possible that could add useful content. Finally, guidelines to provide guidance for adaptation to other regions and tips for course delivery and training content development.

The first phase of the course package project was focused on the definition of the course package structure and on the collection of the training materials developed for the past courses organized by IBIMET and with the contribution from the courses organized by the RTC in Peru.

The main tasks of the further phases included:

1. Collection of training material and reading resources used in the previous courses (and other relevant IBIMET courses);
2. Analysis of data questionnaire distributed to the participants of the 2016 RTC on Verification of Seasonal Forecasts in the Mediterranean (Rome, 15-18 November 2016);
3. Selection of training material collected by the RTC in Peru and other similar initiatives;
4. Definition of the course package structure modules, writing of the descriptions of the goals and objectives of each module;
5. Review of the lecture materials and exercises for each module, partial re-editing of training material and reading resources; development or selection of examples and relevant exercises (based on climatology of the Mediterranean and western South America regions);
6. Writing the User Guide for the package, providing the Course Overview, Learning Objectives, and description of the Topics and Resources, Case studies (from Mediterranean and South America), Tools to be used, and Supplemental Resources;
7. Making the Course Package available online and submitting it as an entry to the WMO Global Campus Catalogue as a single package, with copyright shared with WMO;
8. Reporting on the output of the activity.

The following milestones were expected:

- (a) draft outline of the package contents (31 January 2017),
- (b) draft annotated content of each type of source content for review (28 February 2017),
- (c) draft completed package for review (31 May 2017),
- (d) final delivery of the course package (30 June 2017).

The TOP Course Package

Description of the Course Package

The goal of this online course package is to allow the transfer of seasonal climate forecast knowledge to improve and increase the operational capabilities of the targeted users. The package provides both a theoretical and a practical set of knowledge on seasonal forecast and predictability models, climate and data analysis, forecast verification, and specific application of seasonal forecast for agriculture and water management.

The Structure of the TOP Course Package

The Course Package on Seasonal Forecast is structured in 7 Modules:

- Module 1 – Introduction to seasonal forecasting
- Module 2 – Seasonal forecasting and regional predictability
- Module 3 – Forecast Verification
- Module 4 – Seasonal Forecast Applications
- Module 5 – Climate Services
- Module 6 – Climate Data Analysis
- Module R – R Statistical Software (Tutorial)

The content of each module is organized as follows:

- Learning Objectives
- Lessons/exercises/tutorials
- Case Studies
- Learning Activities and Assignments
- Supplemental Resources

Targeted Users: Trainers and Learners

The course is addressed to national hydro-meteorological service's staff willing to improve their set of competencies or to specialize in seasonal forecasting. In order to meet the heterogeneous needs of the potential users, each course unit will clearly illustrate the prerequisites and will propose external resources to fill knowledge gaps. This approach

allows users to self-define a custom learning path, choosing between the different learning components, in this way it takes into account different levels and needs rather than “one size fits all”.

Trainers can use the Course Package to set up their own training class using the TOP materials to enrich their training content.

Prerequisites

This course package is designed for forecasters and climatologists with knowledge on general meteorology as well as physical and dynamic meteorology, to offer more specific expertise in climate predictions. Accordingly, familiarity with the following concepts is assumed, however, some of these topics will be covered briefly to recap.

Required skill:

- Basic knowledge of structure of the atmosphere, ranges of surface pressure and temperature
- Basics understanding of atmospheric dynamics and thermodynamics
- The general circulation of the atmosphere and oceans
- Weather analysis and forecasting
- Basic knowledge of remote sensing data

Goal & Outcomes

According to the Climate Services Competency Framework approved by the WMO Executive Council of June 2016, the course package addresses the Competency 3: Create and/or interpret climate forecasts, Climate Projections and model output; and more specifically the following Performance Criteria:

- Locate, select and retrieve climate forecasts and climate models output generated by Regional Climate Centers, Global Producing Centers and other institutions;
- Create sub-seasonal, seasonal and longer scale forecast products;
- Apply statistical and geostatistical analysis, including downscaling, to monitor the spatial distribution and temporal evolution of model output;
- Evaluate the performance of climate models output and quantify the associated uncertainties;

- Create value-added products, such as graphics, maps and reports to communicate climate forecasts and climate model information.

After completing the course, learners should be able to:

- Identify and manipulate seasonal forecast products and related information suitable for their specific interests;
- Set up a verification analysis both for probabilistic and deterministic forecasts;
- Identify proper strategies to transform model outputs into climate services for specific applications.

T.O.P. Seasonal Forecast Course Package: the making-of

Foreword: Course Package or eLearning?

The TOP project was not intended as eLearning but as a Course Package. eLearning is a platform mediated process that combines three dimensions: quality content, user engagement, community. The web platform is a crucial component that should ensure usability, stability and functionalities. However, the core component of any eLearning Course is the “content”, as “Content is King”; that is to say, content must be of a high quality and also have a coherent structure, engaging representation and storytelling.

Digital content is not eLearning content: the PowerPoint file of a lecture presentation is not eLearning content, neither is it an eLearning object. The digital version of a training content cannot substitute a face-to-face training session, so the collection and publishing of the digital version of the training material cannot be considered an eLearning course, but a useful archive. The eLearning content requires specific instructional design competencies to develop for example; storyboards, interactive elements, video, audio, infographics. The use of a variety of content format and media is a way to turn more “passive content” into engaging “active content”. Recent trends in eLearning highlight the effectiveness of approaches such as videos and interactive videos, micro learning, learning paths, and a variety of interactions. Web best practices teach that the visual content on the web is more effective than a page (or a presentation) full of text.

So then, how can we define a course package? A set of online resources that can be used (re-used) by other users to improve their competencies and also to build courses on the same topic adding new and specific materials. A course package is in between a structured archive of training digital content and eLearning content. The challenging task of the TOP project was to develop a training package, easily accessible through the web, to be used as it is or adapted and reused by other trainers in face-to-face courses; furthermore, the package could be considered as an advanced starting point to develop an eLearning or a Massive Open Online Course (MOOC).

Building the Course Package

The context: the instructional design model

One of the most acknowledged models for effective instructional design is the Addie Model. There are a vast choice of such models, however Addie model is frequently used, and proposes an approach to the instructional design that it is iterative, and requires review and revision throughout the overall design process. (Hess, A. K. N., & Greer, K. 2016). In this perspective, Addie model is a useful guide to the development of eLearning activities in the context of a wider process.

The ADDIE can be also considered an instructional design framework that lists generic processes that instructional designers and training developers use.

The ADDIE model for e-learning

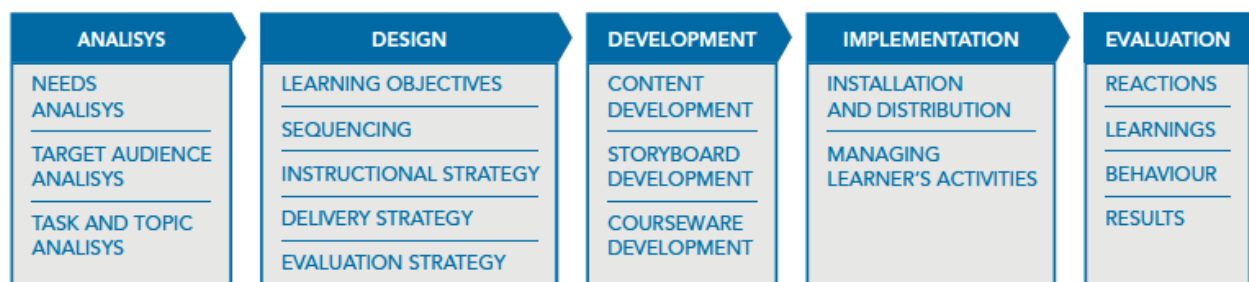


Figure 2: E-learning methodologies: A guide for designing and developing e-learning courses. Food and Agriculture Organization of the United Nations (FAO)

The model identifies five phases to build an effective eLearning:

1. Analysing a learning situation;
2. Designing objectives and principles to address the issues in the learning situation;
3. Developing of resources to meet these specifications;
4. Implementing the learning resources in the learning situation; and
5. Evaluating how these resources addressed instructional needs (Branch, 2009).

Defining the Course Package content outline

In the initial phase of TOP project development, the goal was twofold:

- Select and analyse the materials collected during the previous editions of the face-to-face courses and the RTC- Distance Learning Courses¹;
- Analyse user needs (first phase of ADDIE model) through the analysis of findings of survey on participants' feed-backs and need.

Defining the Course content outline

During the period of two months (December 2016-January 2017) a set of activities have been carried out to reach the first milestone: defining the course content outline to respond to users' needs, and taking into account the training materials available.

Analysis of User Needs

The analysis of users' needs (first phase ADDIE model) is fundamental to better respond to real training needs. This step has been carried out through the analysis of findings of the survey on feed-backs and needs of the participants that attended RTC previous courses.

The survey outcomes highlight that the majority of the trainees declared a high level of satisfaction and considered the distance learning course delivered by RTC-IBIMET "a useful tool to improve their knowledge and competences". Particularly, the practical lessons had the highest rates in terms of effectiveness that could be improved offering more informational material. For the theoretical lessons, participants asked for some more reading material, underlying the need for a more in depth information and practical applications.

These useful feedbacks highlight that eLearning content is more effective when there is a higher interaction; learners-to-content, learners-to-instructors, learners-to-learner, as observed in several eLearning best practices. Such results suggest structuring the theoretical content into small chunks, sequenced logically, and empowered with interactivity and interactions, so as to ameliorate the comprehension and understanding. Moreover, providing exercises and/or activities, asking challenging questions, making

¹ <http://ibimet-rtc.mlib.cnr.it/course/view.php?id=36>

learners think, and making them solve problems close to their professional and daily experience, are essential for deeper learning.

The course package outline

The process to define an outline of the course package was carried out on the basis of previous training courses. The process followed three logical steps:

- (a) identification of the beneficiaries and their training needs using the experience of previous courses,
- (b) identification of learning goals and outcomes,
- (c) draft of the outline of the training course.

Consistency and proposed course outline: a matrix has been developed to put in coherence the theoretical outline and the available material.

Training materials

Select and analyse the materials collected during the previous editions of the face-to-face courses and the RTC- Distance Learning Courses². Each lesson, case study and exercise have been analysed in order to assess to what extent, and how, the collected materials could be reused for the course package.

Building the Course Plan

According to the ADDIE model, the first phase, the design phase, includes also task and topics analysis. The output of this step is the course plan.

The DLC RTC platform (used in the past editions of RTC- IBIMET training initiatives) allowed to have a precise overview of the materials produced by the trainers for the past training initiatives. The course plan illustrates the learning objectives hierarchy. The sequence takes into account the skills that seem to be prerequisites for the other skills. It is an overview of the course learning objectives and the knowledge that will be acquired step by step. The detailed content outline is crucial for the course design, as it provides all the content information, broken down into Modules, Lessons, and activities and assignments. The analysis of the overall training content led to define the hierarchical structure based on

² <http://ibimet-rtc.mlib.cnr.it/course/view?id=36>

modules, where each module includes learning objectives, lessons, case studies, seminars, exercises, structured bibliography, and readings.

The course plan structure

Module (group of lessons): The Module Introduction provides a brief overview of the module and a brief description of what the learner will learn and the lists of topics.

Lesson: lessons contain topics that correspond to the learning objectives of the lesson. Each lesson teaches two or more related objectives. The Lessons are illustrated in the Outline Document.

Case Study: useful practical examples of the topics discussed in the lessons. They are part of the module and learners should go through the seminar to complete the module.

Learning Activities & Assignments: This content type includes Seminar & Exercises. Seminars are an insight on a specific topic.

Supplemental Resources: This section includes useful materials such as links and bibliography.

Content Review and Course Package Development

During the period February-May 2017 the course materials were adapted, re-edited and organised to fit the defined structure. The structure was specifically designed to provide participants with both theoretical and a practical set of knowledge on seasonal forecast.

The course package structure includes the modules outline with learning objectives, case studies, in-depth studies, quizzes, structured bibliography and readings.

Furthermore, the package contains some essential guidelines to facilitate the course adoption by a wide number of institutions and instructors, and to produce additional training content - e.g. to better meet students' needs -, and modify content to fulfil their regional and national or institutional education standards.

Building the Information Architecture (IA) of the TOP

IA structure and the collaborative approach

Following a collaborative approach, the course Plan has been developed using google drive docs, allowing project team members to share and collaborate.

Each Module contains documents and folders as shown in Figure 2.

The Learning Objective document describes the skills and abilities that learners will acquire in the module.

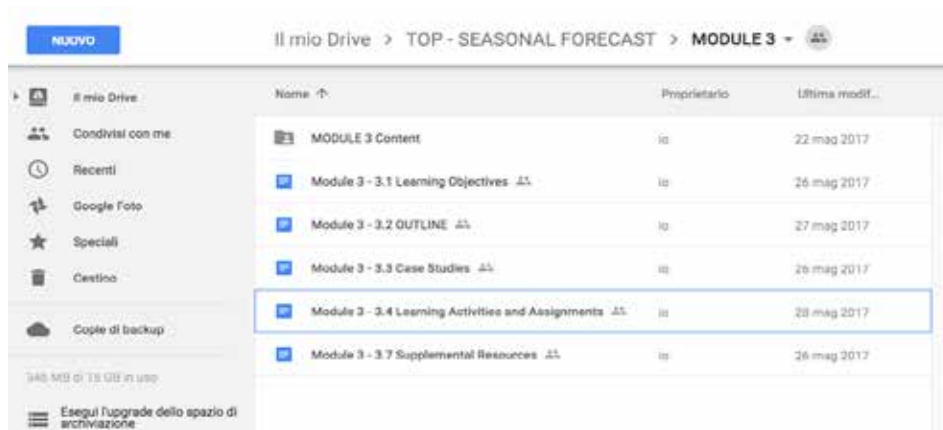


Figure 3: Screenshot of the document folder structure of a module in Google Drive

The folder name displays the number of the module, the hierarchy within the module and the section; the file names include the number of the module, the hierarchy in the topics outline and also the type of content (e.g. C=Case Studies, S=seminar).

3.1 Principles of Forecast Verification

Riccardo Benedetti - Consorzio LAMMA (Regione Toscana-CNR)

OUTLINE

❑ BASIC FEATURES AND DESIDERATA

Scientific Prediction
Probabilistic Forecasts
Basic Desiderata for scoring

❑ LOGARITHMIC SCORE

Logarithmic score uniqueness
The "fair score" and its properties
Logarithmic and Brier score comparison

❑ EXAMPLES OF APPLICATIONS

Climatological skill score
Example of application
Forecasts vs observations

Lesson Presentation

<https://drive.google.com/open?id=0B0IYhkEYkYw8dnpLNFdxS2RYWnc>

Reading PDF Document

Riccardo Benedetti - Consorzio LAMMA (Regione Toscana-CNR)

Forecast Verification - Basic principles

<https://drive.google.com/open?id=0B0IYhkEYkYw8YlVWTGJ5YnRyYTQ>

Figure 4: Screenshot of Outline document

The **Outline Document** illustrates the lessons included in the module, gives detailed information on the content format, with a link to the resource file.

The content materials are labelled depending on the format Slide presentation, Video and on the type of content Lesson, Seminar, reading, exercise, (see figure below).

Part 1 **Introduction**

Lesson Presentation

<https://drive.google.com/open?id=0B0IYhkEYkYw8V1FibDU0RWRWSnM>

Lesson Video

<https://youtu.be/vScKb-EpFWs>

Figure 5: Screenshot of Outline document, labelling the different type of content

Each label has a different colour to easily distinguish the type of content and the format.

The legend is as follows:

Lesson Presentation

Lesson Video

Case Study Presentation

Reading PDF Document

Seminar Presentation

Exercise Documents

Note: the same criteria has been used in other documents, associated with colour code for different types of content.

The **Case Studies** documents collect the case studies related to the topic of the module.

The **Learning Activities and Assignments** document includes exercises and seminars. Exercises are grouped into this section, although they can be placed at the end of a specific lesson, or at the end of the module as the final exam. This choice depends upon the type of platform that will be used to deliver the training.

The **Supplemental Resources** document lists resources such as links and bibliography. Due to copyright restrictions, the academic articles and books are not linked to the source file.

About the hierarchy structure

“A module aims at developing a clearly identifiable and certifiable portion of the curriculum, expressed in terms of competence objectives.”³ Modules could be used for a higher level of learning, whilst units could be considered a sub-division of modules. The analysis of the training content points out that some lessons, within a module, could be treated as a separate sub-module, and then re-organized as a set of bundled modules.

An example:

| Course 1

 |Module 1

 |Unit 1

 |Lesson 1

 | Lesson 2

³ <http://www.learningpaths.org/papers/modules.htm>

In this phase of the project, the structure here proposed, fulfilled the need of building the course package. For future eLearning design phase, an instructional design transdisciplinary team will have to review the structure in detail, considering also to adopt a different hierarchy.

Content Review and Adaptation

The review of the selected training materials of the previous courses was aimed at choosing the approach that could best fit the learning purpose of each lesson, the type of content and the teaching topic. The heterogeneity of the training materials required the adoption of different approaches to adapt the materials for the course package.

Most of the material was not conceived for distance learning and the trainers were not asked to provide annotated material. Therefore, the adaptation and re-editing was mainly focused on combining slide presentations with audio or annotated comments, pre-recorded webinar, and documents/eBook. The majority of the materials were slide presentation, for some we provided annotations or videos, for some others re-editing and reorganization of the slide presentations, but it was not possible to do it for all of them, so some presentations have been included although there were no annotations (or videos).

Videos are widely used in eLearning and distance training courses, but only some of the lessons from previous courses were video recorded. In these cases, the best option adopted was to associate slide presentations with the videos. Another solution was to produce from scratch some media content, involving lecturers in webinar sessions, as we did for the case of Stefano Materia <https://youtu.be/iXwMUQ8-Q9c>, or screencast with audio for IRI/LDEO Climate Data Library.

In some modules, we used also some acknowledged external resources, such as videos, published presentations, links or other publication (e.g. install & set up of R - third party authorship YouTube video).

The course package proposes public and available resources that can be used as training materials. In order to facilitate the adoption of the course material for self-teaching purposes, we added the references to papers/documents cited in the presentations in the "Resources" section of each module.

Content Type: Slide Presentations

When converting training materials, created for a traditional training class, into a digital format for an eLearning one of the main challenge is to switch to content "developed in a

consistent and reliable fashion” (Molenda, Reigeluth, and Nelson 2003) following some instructional design principles. And this can be a true challenge.

For instance, the process of converting a slide presentation into eLearning content could benefit from the full potential of instructional design techniques by harnessing the functionalities provided by the web technologies, such as interactivity, animations, call to actions, etc., in a manner that takes care of the cognitive load on learners. Thus, the slide presentations are a support tool both for the trainer and the trainees, but a slide presentation as-it-is cannot fully substitute the trainer.

In RTC Courses, the trainers designed their lessons to transfer complex and detailed knowledge in a face-to-face class. The assessment of the selected training materials highlighted that they were designed to give presentations in a classroom, where time schedule and interactions are different from learning/teaching in a digital environment.

Furthermore, there is a general tendency to create presentations text-heavy that could be diluted into 2 or more slides. Lengthy content has a low degree of eLearning effectiveness. So, the challenge is to convert them into short e-learning courses/lessons. As a matter of fact, the length of slide presentations is one critical point, as in digital learning environment long lessons should be split into smaller units - of 5 min up to 10 min max -, to ensure granularity.

In this perspective, for TOP course package some presentations were redesigned and edited, some text-heavy contents have been split into two or more parts or transformed into a pdf document format file as reading materials, and some other content has been transformed into a screencast.

Content Type: Audio podcast

Podcasts are convenient eLearning tools for the training audience. Podcasts can be useful to listen to the speech of an online presentation, follow along with a tutorial. Podcasts can be uploaded to a digital sharing platform or embedded into the eLearning course design. It can be an immersive experience for some subject matters, particularly useful to give experts' point of view on specific topics, interviews, and insights.

In the TOP project, we experimented the podcast as a tool to explore web climate services topic, building from scratch a sort of interview with questions and answers.

Course Image

The redesign provided also the design of the “course image”

- project/initiative logo
- a slide presentation layout template (ppt and keynote formats)
- a cover document template (customizable) - Indesign format
- a document template

The slide presentation template includes several the slide layout and guidelines for fonts and colour scheme, to use in all documents and communication materials.

Copywriting and Licences

Publishing any training material implies to have the right to publish, adapting and distribute it online for a specific purpose. This authorization must be obtained directly from the authors. In our perspective, we would recommend that a full lesson (presentation, video, podcast...) is reused as a training unit as it is, in order to respect the learning approach/process of the author. It is compulsory that the author is always acknowledged (authorship).

In a wider perspective, we would suggest the same approach used by the *Climandes* Information booklet:

“The publishers and partners encourage the use, reproduction and dissemination of material in this e-learning product. Except where material belongs to other rights holders, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of the institutions mentioned as the source and copyright holder is given and that the institutions' endorsement of users' views, products or services is not implied in any way.” (from *Climandes* Information booklet, Climate Science eLearning course <https://goo.gl/4cERxg>).

TOP Licences

There are different types of licences, particularly the Creative Commons Licences allow to distribute content free culture or not free culture.

We asked the teachers to indicate under which license they would have preferred to distribute their works choosing between the following licences.

- CC BY-NC-ND 4.0 (Attribution-NonCommercial-NoDerivatives 4.0 International) Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) <https://creativecommons.org/licenses/by-nc-nd/4.0/>. The users are free to Share — copy and redistribute the material in any medium or format, but not to build upon the material and not for commercial use. (Not free culture)
- CC BY-NC-SA Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) <https://creativecommons.org/licenses/by-nc-sa/4.0/>. The users are free to: Share — copy and redistribute the material in any medium or format, Adapt — remix, transform, and build upon the material but not for commercial use (free Culture)

TOP Course Package: the online publishing

The final course outline with embedded Google documents and links to training materials, was organised into a Google Site⁴, so as to have an accessible and shared version of the TOP course package -> <https://sites.google.com/view/top-seasonal-forecast/home>.⁵

This website is not meant to be a strict eLearning training course, but an advanced (augmented) course plan. This solution could be considered as the building block of a wider process aimed at developing a fully-advanced eLearning training course based on Instructional Design Model and on user needs and interactions.

Following the recommendations, comments and contributions received on the second report and on the TOP Google site, some adaptations have been developed during the months of June and July 2017. The Google Sites initially developed were intended as a tool to share in this first phase the materials collected with a restricted group. To have a fine-grained

⁴ Note: Google Sites have some interesting features: possibility to easily embed google documents into pages, and no technical maintenance to be performed.

⁵ On June 7 2017, a second interim report and the link to the TOP google site were delivered to WMO.

management of roles and permissions, and a better make use of the whole materials, the training materials were published in a web platform where users were asked to sign up to access the content. Therefore, the idea was to integrate the TOP course package in the *Climateservices.it* portal, developed by IBIMET-CNR, as the Climate Services CNR IBIMET Training Initiative is part of the IBIMET Climate Services Project.

Prior to adopting any solution, we evaluated some LMS and other eLearning platforms and some authoring tools.

eLearning Platforms & Services

There are different new eLearning platforms offering different features and services.

To simplify, we can say that an LMS is a platform to publish a course, while a MOOC is a course, but a particular type of online course. This means that the most popular online e-learning platforms - Coursera, edX, Iversity - are both an LMS and a MOOC. For example, following a course on Coursera means using the Coursera LMS to follow a MOOC. But not all LMSs offer MOOCs. The main difference between a normal course of any LMS platform and a MOOC is that in the latter context, the interaction between students and teachers and between students is a key element in learning. In this sense, blogs and wikis associated with the course are the tools through which to make a course dynamic. The learning ecosystem aims to realise a true learning experience. A process that brings together three dimensions: quality content, involvement in a context (the activities that are being proposed) and support for an active community of peers, mediated by an online platform. Learning and eLearning are therefore a social process, active and dynamic.

There are self-hosted learning platforms (Moodle - there is also a Moodle Cloud version-, LMS EdX), and online learning platforms (Coursera, Canvas, Iversity, Adobe Captivate Prime, Articulate 360 and Thinkific) are platforms Software-as-a-Service. The differences between the platforms are related to features offered & prices.

Besides the above platforms there are several authoring tools to create learning objects in HTML5:

- [Storyline Articulate](#)
- [Adobe Captivate 9](#)
- [Obsidian Black](#)

This new generation of cloud platforms proposes a new learning experience focused on high usability level and cross-platform content. These platforms propose a set of standard

content, with embedding of videos, interactive graphics and any other web based content. Moreover, in the changing learning practice and behaviour, the mobile version is a must. From the more academic focused to the more business oriented services, the convergence is to develop well-structured and engaging courses, easy to access and eclectic, offering supplemental learning materials.

We experimented the conversion of the training material of Module 6 into an online course, managing specific “constraints” (standard type of content, format, navigation, etc.) that some eLearning platforms have.

For the testing purpose, we chose Thinkific, as this platform offers free unlimited space and option for unlimited courses, and an efficient customer help support. Although there are no SCORM courses, there is an interesting feature for the presentation content type: when the presentation is uploaded, every slide is converted into a page where the instructor/or administrator can record a separate audio for each slide.

The prototype: <https://rtc-ibimet.thinkific.com/>

This experiment highlights that the content we used, in order to be published in this platform, has been reorganised and chunked into smaller units, including also some screencasts. The overall structure of the course needed minor changes, to ensure overall coherence and keeping the focus on one topic at time. In such eLearning structure, the materials gathered in this first phase should be analytically reviewed, with the help of storyboarding and instructional design models and technique; moreover, new reach media content (video, screencast, interactive graphs), could empower the worth of content.

Final version: the training.climateservices.it website

IBIMET-CNR has an acknowledged experience on Climate Discipline and Applications. The face-to-face training initiatives carried out by the Institute in the last years allowed to collect scientific materials by the most accredited experts in the field. Moreover, IBIMET is leading the Regional Training Centre of the World Meteorological Organization (WMO-RTC) in Florence. In this perspective, the TOP course package could be part of the IBIMET training initiative.

In this framework, a website dedicated to training activities was used to make available the course package, built upon an e-Learning infrastructure developed (Wordpress platform and Learnpress plugin). The training website is rooted in the acknowledged experience of IBIMET on Climate Discipline and Applications. The face-to-face training initiatives carried

out by the Institute in the last years allowed to collect scientific materials by the most accredited experts in the field. This website is focused on training and knowledge sharing; it includes a set of online resources specifically aimed at disseminating climate knowledge, expertise and operational principles. The resources are freely accessible through sign up to enrol each course and download specific materials.

The Climate Services CNR IBIMET Training Initiative is available at <https://training.climateservices.it/>.

The T.O.P. Course Package can be freely accessed at <https://training.climateservices.it/rtc-ibimet/t-o-p-seasonal-forecast/>

The overview of each module does not need any registration but to access the lectures and download the material users have to subscribe and then enrol each module. This guarantees the usage tracking of the course package.

The whole portal has been published to the public in September 2017.



Figure 1. The T.O.P. Course Package web page on <https://training.climateservices.it/rtc-ibimet/t-o-p-seasonal-forecast/>

Lessons learnt

The need to transform or adapt f2f materials into digital content for the course package, shared archive, and even for eLearning, can be not so rare. The development of this course package highlighted that the adaptation of the materials, not specifically designed produced for eLearning, in many cases would require a lot of work and in some few cases to rebuild almost everything from scratch. In the TOP course package, there are few examples of the different type of learning materials that could be used, and some notes/suggestions on how to manage and design the course/lesson content. Thus, it is advisable to design and organize training materials from the initial planning phase, so not to preclude any opportunity for future and further usage of the materials. The Guide for Adaptation includes some suggestions to better manage learning products and tools, e.g. the video recording of f2f the lessons, slide presentations tips. Moreover, for a better and more engaging online learning content experience, we think that some fine tuning on the making of the slide presentation to ensure adaptation for course package or eLearning (e.g. each presentation should be divided in sub-units no more than 8/15 min long). From the web point of view, we also envisage that any online training initiative should be built upon user needs that in the web sphere means paying more attention to the instructional interface design process, and to the latest trends on UI (User Interface) and UX (User Experience) design.

The main lesson learnt is that the overall project allowed us to improve the management of eLearning assets and to define a fine-grained process to plan, create and organize training materials that could (and should) be applied to the forthcoming training initiatives. A virtuous cycle to set up a new challenging life-cycle of any training based project.

Guides

The aim of this guide is to give some general suggestions on how to create, manage and publish digital training material. The aim of this guide is to facilitate the exchange and adoption of training materials between a wide number of institutions and instructors, that will have the possibility to add and modify content to fulfil their regional and national or institutional education standards. Our recommendation is to consider that other trainers should be able to use either part of a lesson (lecture, video, podcast) or the lesson as whole, but without modifying the author's work. However, it is strongly recommended to apply a licence that states clearly the copyright and how the materials can be used.

Guide for Content Adaptation

Presentations TIPS

Presentations are a good starting point to create training or eLearning content. To improve and level out the quality of the presentations, we recommend a set of simple guidelines, in order to get homogenous content that can be converted into different formats and used for different training tools.

Chunking content: small is big

1. Divide the entire the presentation into large identifiable sections.
2. Analyse each section to assess if it can be made smaller. Any section which can function as a standalone topic should preferably not be combined with others.
3. The first one or two slides should include a presentation structure/outline highlighting the learning objectives.
4. Avoid text heavy slide, splitting complex slides into two or more slides.
5. Each chapter/section should be introduced by a headline slide.
6. The presentation should include some bibliography, and useful links.

Point 5 and 6 are useful hints for the instructional designer that will work in a team with the author to create the eLearning content.

Create a form for each slide presentation to summarize: presentation type, presentation title, authors, keywords (useful to define course categories and tags), learning goals, skills and competences required.

See an example template *e.g.*

<https://drive.google.com/open?id=0B0IYhkEYkYw8ZWNVTkd0Rk5jX0k>

Designing the layout

- Create a clean presentation template avoiding heavy graphic elements that could represent a constraint (like heavy box frames, or headers and logo lists in the footer);
- Choose a set of typographic elements for titles (h1, h2, h2, etc.) and body;
- Multimedia such as images, labelled diagrams, videos, etc. are worth thousands of words. Check resolution images and graphics, discard low resolution images;

- Preferably avoid any animation if it is not fundamental (when exporting to pdf either use some plugins to split each slide into several slides or recreate each stage of builds in separate slides before converting, in Keynote - Apple there is an option to export to pdf and print each stage of builds); consider to transform the animation into a video to be inserted into the presentation

Annotations and Comments

A slide presentation is a support to the trainer. In order to use lesson presentations as an eLearning content, there are different options to recommend:

- Add some annotations/comments in each slide. PowerPoint, Google slide, and Keynote, in the editing mode, allow to write a comment in a specific text area; comments can also be printed or displayed during the presentation. Please note that an annotated presentation is the best starting content to build an eLearning object; some authoring tools for eLearning easily convert slide presentations into learning objects (e.g. Storyline Articulate),
- Record an audio, as narrations can enhance a web-based or self-running slide show. PowerPoint and Keynote have this functionality. The presentation with audio can be exported as a video. The video can be uploaded to a web platform, or to YouTube or Vimeo; in the latter case, the video can be displayed/published in a webpage or in an eLearning platform as embed. Some eLearning platforms or authoring tools allow to record and add an audio comment on each slide (e.g. Articulate, thinkific.com)

Tools

The popular softwares on which to build presentations are:

- PowerPoint
- Keynote
- OpenOffice Impress

Some graphic professionals use Adobe-InDesign.

There are also some cloud solutions that could be taken into account for specific purposes:

- Google Slides: despite the poor features in terms of functionalities (e.g. ignore slides, images management) this google tool is useful for collaborating and sharing; files can be exported in several formats including PDF and SVG;

- Canva <https://www.canva.com/> allows also to create infographics and other types of graphic content; it comes with clean templates, and the presentations can be downloaded in pdf or image formats;
- Prezi.com is a presentation tool that instead of slides makes use of one large canvas where to pan and zoom to various parts of the canvas; videos and other media can be placed into the canvas to emphasize the ideas presented; the presentation can be embedded on a website or downloaded for offline usage. It is not so easy to make a good presentation with Prezi, and the exported ppt could require some editing.

Note: Sharing a source file presentation, in different formats, could facilitate further modifications and localizations.

Images and graphics

Graphics, images and illustration are extremely useful to create engaging presentations. Moreover “it is indeed more difficult for audiences to process information when it is presented in spoken and written form at the same time.” (Reynolds 2012).

There are some general guidelines and books that could be useful to learn how to create an effective presentation. The most popular are:

- Reynolds, G. (2012). *Praise for Presentation Zen : Simple Ideas on Presentation Design and Delivery* , Second Edition.
- Duarte, N. (2008). *Slideology* (Vol. 1).

The approach suggested by Reynolds and Duarte is a good starting point, but consider that every discipline has its own knowledge framework and its own visual representation. In this perspective, it could be interesting to experiment new ways to visually communicate Climate and Seasonal Forecast Sciences and create a disciplined based approach to text and visual content, particularly for eLearning purposes.

Free resources

There are some Creative Commons (CCBY) resources for photos, and graphics

- <http://www.freepik.com/>: vectors, illustration, photos
- <http://unsplash.com>: high resolution photos
- <https://thenounproject.com/>: icons in svg and png format

Authors, Fair Use & Permission

When authors share their training material, it could be recommended to ask their permission to use it in an eLearning project, clearly highlighting that the materials will be “processed” (redesigned and organized) for eLearning development purposes. Creative Commons (CC) has released several copyright-licenses to fit different usages rights. (<https://creativecommons.org/>). Never forget to quote resources by other authors.

Videos

Videos for eLearning purposes are considered a “killer” content to engage learners. Hypermedia structures increase interest and motivation, adapt to preferences and cognitive needs, allow active and constructive information processing, and stimulate the acquisition of self-regulatory skills (Scheiter and Gerjets 2007). Other research results highlight that pages (or presentations) too text-heavy do not facilitate learning or understanding (Hess, A. K. N., & Greer, K. 2016).

Videos are a great content but they require both some skills and tech equipment.

In eLearning courses there can be different types of videos.

- Introductory videos to introduce the overall course (e.g. [by European Journalism Centre](#)), or tease the lesson (e.g. [Course Teaser - Charting tools for the newsroom](#), [DAVID MAMET TEACHES DRAMATIC WRITING](#)).
- video lessons
- screencast

The first type, as showed in the examples, is more “video maker” style, with a lot of post production, while the second type (video lesson) can vary. In both cases, it is recommended to “brand” the video with opening titles and a soundtrack.

Introductory videos

Before recording an introductory video, it is recommended to first create an outline of the topics to cover in the video. An outline will also help to keep the video to a reasonable length, and file size. An average video is length is 3-5 minutes for introductory, and from 10/20 min for a lesson.

Which information should be included in the video and how to present it?

- (a) Generally speaking there is some information that might be included:

- Welcome to the participants, including introducing yourself, your title and field of expertise;
- The importance or reason for this course;
- How or why this course is relevant to the participants;
- How the course is organized and will be delivered;
- The course overall goals and learning objectives.

(b) The main suggestion is: keep it simple; consider different style and narrations type and choose the one that you think is more suitable for your audience.

Write a Script

A script is literally what you plan to say while recording. A script is useful also to have the transcript already prepared.

Recording a lesson or a seminar

A F2F lesson could be a good opportunity to video recording and then optimize the video with some post-production.

However, there are some precautions to be taken into account:

- Check the room source of light and setting
- Make some video tests before recording
- Talk to the presenter in order to know which are his/her presentation habits (“I prefer to move”, “I prefer to sit”) and trying to find a good mediation between video needs and presenter habits
- In team with the presenter go through the presentation before the video recording to better understand topics and the structure of the presentation.

Some post-production work will be needed:

- Video editing and cutting
- Opening title, soundtrack
- Audio editing
- Text and captions.

Video model releases

When shooting during a conference or a training classroom, good practices suggest to inform the participants that the lesson will be video recorded and they could be shot in some video frames. This sounds too precautionary since it poses the issue in terms of "personality rights" laws, that limit the use of people image for specific reasons. As these videos have educational and non-profit purposes, it could not be the case of "personality rights" infringement. However, the organizers should consider if this could be an issue, and decide to ask the participants' consent. Consider that, some images could be reused for communication materials and teasers. Therefore, to avoid any problem, the organizer could invite the participants to sign a Photo/Video Consent and Release Form.

Screencasts

A screencast is a video recording of a computer screen, and usually includes audio. Common examples of screencasts are onscreen tutorials, video lessons, or Slideshare presentations. Screencast are particularly useful when illustrating software, web application, or web platform.

Before starting to screencast it is recommended to define the outline and write a short script. Some post-production work will also be needed.

There are several tools for screencasts, here is a list of the most commonly used:

- Adobe Captivate
- Camtasia Studio
- Screenflow
- OBS - Open Broadcaster Software
- Camstudio
- Screenr
- Jing
- Snagit
- Microsoft Expression Encoder
- Screencastify

Video Post-production

A specific competence is needed for video making. However some post-production can be performed by non-professionals with some practise and some video tutorials on YouTube.

There are several softwares and tools from the basic ones to the more complex and professionals. There are also online tools, such as [YouTube Editor](#).

- professional software: e.g. Adobe Premiere, Final Cut
- amateur software: e.g. Camtasia, iMovie, Movie Maker

Whiteboard & Animated Videos

Whiteboard videos were made by hand, with a time-lapse video of someone's hand drawing on a whiteboard. Now the process can be managed with specific software.

This type of video is used to create explanatory videos. The best examples of whiteboard videos are:

- RSA animated series <https://www.thersa.org/discover/videos/rsa-animate>
- Commoncraft teaching videos <https://www.commoncraft.com/videolist>

This peculiar video type can be created also with some specific software:

- <http://www.videoscribe.com>
- <https://www.rawshorts.com>

There are tools also for animated videos such as:

- <https://www.animaker.com/>
- <https://www.powtoon.com/index/>

Consider to use Adobe After Effects for professional results, however it requires some training and practice as it is a very complex software.

Webinar

Webinar is a useful tool to deliver content, to interact with learners, and to build a community. Webinar can be used for virtual classrooms, training sessions, and presentations. There is a difference between a web conference and a webinar: the webinar implies interaction between attendees and presenter. There are specific web technologies to be used.

Furthermore webinars (or web conferences) can be recorded and rebroadcasted, for asynchronous eLearning.

Tools and Platforms

There are several ways to run webinar/web conference: e.g. YouTube live event, WebEx, zoom.us, demio.com. And also, some software for a more custom service (e.g. the OS Open Meeting).

YouTube live event is free, and records a video file of the whole webinar (the file can be downloaded). Other tools, require an annual or monthly subscription plan.

Podcasts

Podcasts are one of the most convenient and portable eLearning tools. An eLearning podcast is quite similar to a radio programme, and it suits for content such as introductory or general overview, case studies, best practice storytelling, and for expert interviews. Few examples:

- **MIT:** “What’s the science behind climate change, and how can we combat a warming climate? Those are complex questions that MIT faculty are actively pursuing. In this podcast, four MIT professors— Dan Cziczo, Kerry Emanuel, Christopher Knittel, and Andrew Whittle—will discuss their climate research on areas including hurricane activity, coastal flooding, carbon dioxide, and economic policy. Read more: bit.ly/1ErRX5Y”
<https://soundcloud.com/mitalumni/the-research-and-science-of-climate-change>
- **“Warm Regards”** is a podcast about the warming planet. The show is hosted by meteorologist Eric Holthaus. Co-hosts are Jacquelyn Gill, a paleoecologist at the University of Maine, and Andy Revkin, a veteran journalist at the New York Times.” <https://soundcloud.com/warmregardspodcast>

A podcast should be branded: mention the organization name, website info, and any other contact information that a listener might need. Use a style that aligns the target audience to the eLearning goal (tone of voice).

The audio files (mp3) can be uploaded into most of the eLearning platforms or in content sharing platforms such as YouTube, Soundcloud, or see for other alternatives at

- <http://hiphopspeakeasy.com/2017/02/alternatives-soundcloud-ultimate-guide/>

Tips

- Create a detailed outline or an eLearning storyboard for every podcast. The outline is useful to decide which topics to include in each episode.
- Create a podcast template. Some elements can be reused in every episode, such as audio intro and sound effects. The eLearning template is just a general guideline that can need minor adjustments, depending on the subject matter.
- Get online learners behind the microphone. In some cases, and depending on topics discussed, the learners could be guided to produce their podcasts, to share experiences and solutions adopted, and also to contribute with interviews and suggestions to the podcast making.
- Invite guest speakers and interviewees, who are experts in the field or have an interesting take on the topic.

Tools

- Microphone. Some laptop or desktop microphones allow to have an acceptable audio quality.
- Recording and editing software. e.g.: Audacity (Windows, OS X, Linux) is the standard for free audio-editing. For Mac users there is also GarageBand (OS X). Adobe Audition Creative Cloud, Wavepad are more professional.

Visualizing Data

“Data visualization refers to the techniques used to communicate data or information by encoding it as visual objects (e.g., points, lines or bars) contained in graphics. The goal is to communicate information clearly and efficiently to users. It is one of the steps in data analysis or data science.”⁶

⁶ Wikipedia

Data visualization is the presentation of data in a pictorial or graphical format. The interactive visualization of data, goes a step further for a more interactive experience.

Data visualization can be developed as static visualizations with several tools and then exported into learning materials.

There are several data visualization web services that create visualization that can be embedded in any eLearning platform.

☐ **Datawrapper:** Line Chart, Bar Chart, Stacked Bar Chart, Map, Donut, Table. Data can be Copied & Pasted, Datawrapper use any data from Excel, CSVs, PDFs or the web. There is also a free plan: Single 10k, 10.000 visualizations.

<https://www.datawrapper.de/>

☐ **Plotly:** charts, presentations and dashboards. For analysis: JavaScript, Puthon, R, Matlab, Jupyter or Excel; there are several options for importing data. It is a paid service, but there is also a free plan <https://plot.ly/>;

☐ **Highcharts** supports line, spline, area, areaspline, column, bar, pie, scatter, angular gauges, arearange, areasplinerange, column range and polar chart. It produces animated JavaScript and HTML5 SVG graphs. It is built on top of jQuery, little programming skill to create a simple web chart. It is free for a personal website, a school site or a non-profit organization. HTML 5 based on native browser technologies, no plugins needed; Open on GitHub; compatible with browsers including mobile, tablets and old IE back to IE6.

<https://www.highcharts.com/>;

☐ **DataHero:** DataHero is self-service cloud BI that allows any user to quickly connect to cloud services. It combines datasets from different services; dashboard are automatically updated for data sharing. It is a paid service, the free plan allows to create and share charts, import directly from 26+ services (e.g. SPSS), upload Excel and CSV files, unlimited uploads up to 2 MB <https://datahero.com/>;

☐ **Chart.js:** Simple yet flexible JavaScript charting. Open source (available under the MIT license.), 8 Chart types each of them animated and customisable, HTML5 Canvas, responsive. It requires some development knowledge <http://www.chartjs.org/>;

☐ **Tableau:** the app can be downloaded for free (there are also paid plan that includes other features) and the visualizations created are saved and stored in Tableau public user

profile. The visualizations can be embedded in any webpage. The free plan includes 10GB of space. Data source: Google Sheets, Microsoft Excel 2007 or later, Text files – comma separated value (.csv) files, JSON files, Statistical Files; SAS (*.sas7bdat), SPSS (*.sav), and R (*.rdata, *.rda), Spatial Files (ESRI shape files, KML, and MapInfo), Web Data Connectors, OData <https://public.tableau.com/s/>;

Exhibit is a fully open-source publishing Framework for Data-Rich Interactive Web Pages by MIT. Exhibit is used to create web pages with advanced text search and filtering functionalities, with interactive maps, timelines, and other visualizations

<http://www.simile-widgets.org/exhibit/>;

Other visualization tools can be found here <http://www.visualisingdata.com/resources/>.

Visual storytelling

There are visual tools to create interactive stories, displaying information with text, videos, images and audio. These visual solutions can be used as embedded in any web page. Here below some examples:

TimelineJs by Northwestern University Knight Lab. This free and open source tool creates visually rich, interactive timelines to be embedded in webpages. Data source: Google spreadsheet. Custom installations with some JSON skills

<https://timeline.knightlab.com/>;

StorymapJs by Northwestern University Knight Lab. It is a free storytelling tool to tell stories on the web highlighting the locations of a series of events. StoryMap JS can pull in media from a variety of sources. Twitter, Flickr, YouTube, Vimeo, Vine, Dailymotion, Google Maps, Wikipedia, SoundCloud, Document Cloud and more.

<https://storymap.knightlab.com/#overview>;

Juxtapose JS by Northwestern University Knight Lab, easy-to-make frame comparisons. It compares two pieces of similar media, including photos, and GIFs. It is ideal to explain slow changes over time or before/after stories that show the impact of single dramatic events (natural disasters, protests, wars, etc.);

SoundCite by Northwestern University Knight Lab allows to add inline audio to a text <http://soundcite.knightlab.com/>.

The eLearning Team

In a perfect world, the perfect eLearning team is a transdisciplinary team, where each professional plays his part in the overall process. A perfect team should include: eLearning Project Manager/Team Leader, Instructional Designer, Subject Matter Experts, Course Authoring Specialist, Learning Management System Specialist, Graphic Designer, Communications Manager, IT Specialist and a QA Tester.

When setting up an eLearning team in a real world, it is important to know which is the perfect set of competences of an eLearning “dream team”; this allows to better define the right set of team competencies needed and the best sustainable team solution to reach the eLearning goal.

Promoting eLearning

The following few lines, far from being a dissertation on how to build eLearning communication strategy, are just a reminder to underline that a communication strategy should be needed to better disseminate and promote eLearning initiatives and to build engaged communities of practices.

In a Digital Communication Strategy, different approaches, tools and techniques can be used to reach a wider audience and to disseminate eLearning initiatives to the right audience and also to selected media. Furthermore, the web as dynamic environment offers a variety of promotion channels, e.g. <http://www.climate-knowledge-hub.org/>.

Some specific communication plan and tools should be developed as a result of a shared process amongst key actors of the project team. This plan should also include some SEO analysis and social media management to monitor and tailor better campaigns. In this perspective, a @IBIMET_RTC Twitter account has been created to be used as a communication channel for the RTC community members to share information and resources.

Guide for Geographical Adaptation

This course package has been explicitly designed for the Mediterranean region. However a large part of the documentation, presentations and case studies provide relevant and salient information useful for building knowledge in other regions of the planet.

Basic information on the procedures adopted for seasonal forecasts, the use of global numerical models, quality improvement strategies, and forecast reliability can be used directly in different geographic contexts from the Mediterranean.

In contrast, aspects related to observed climatic variability, the expected one, and some of the case studies represented should be adapted when applied in different geographic areas but they could be still considered significant in other parts of the Earth, especially in regions of medium latitudes.

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