



**H2020 - Research and Innovation Action**

# APPLICATE<sup>\*</sup>

**Advanced Prediction in Polar regions and beyond: Modelling, observing system design and Linkages associated with a Changing Arctic climaTE  
Grant Agreement No: 727862**

**Deliverable No. 7.4  
Training Plan**

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## Submission of Deliverable

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## EXECUTIVE SUMMARY

This training plan describes the components of and the plans for education activities included in WP7 of APPLICATE. To optimize the efforts, the training plan has been prepared at the beginning of the project, outlining not only the activities itself, but plans for their implementation as well as the expected risks and interdependencies. The major training activities planned include (1) a webinar series on the APPLICATE project and on the impact of Arctic changes on the weather and climate of the Northern hemisphere, (2) a summer school planned for 2018 on polar prediction with instruction in both modeling and observational methods, (3) an online course entitled „Advancing Predictive Capability of Northern Hemisphere Weather and Climate.“ This document provides details on both the planned activities themselves and the approach by which they will be accomplished.

The webinar series was held in fall 2017 and served as an introduction for the APPLICATE project to the early career polar science community.

The summer school was based on a previously-run school organized by the Year of Polar Prediction. It took place at Abisko Station, Sweden, from 17 - 27 April 2018. The school was organized by a project manager based at UiT, with help from APPLICATE members, other partners and volunteers from the Association of Polar Early Career Scientists (APECS).

Finally, the online course will run from September to December 2019 with the aim to train early career researchers and prepare them for careers in Northern Hemisphere prediction science.

## 1. INTRODUCTION

### 1.1. Background and motivation

Training not only aims to improve the professional skills and competences of those working and being trained to work within APPLICATE, but it also provides a legacy for future generations of scientists and early career experts working in the fields of climate and weather prediction and modelling. APPLICATE therefore includes a strong training component with a set of tailor-made training activities that will be held throughout the duration of the project. An assessment of the activities will be conducted at the end of the project to determine their usefulness for the target groups and provide advice to future projects. All training materials, recorded webinars, lectures and presentations from the summer school, the webinar series and the online course will be provided as an open resource on the website of APPLICATE and the website of the Association of Polar Early Career Scientists (APECS). Coordination of training activities and synergy with other on-going projects (e.g. YOPP, Blue Action, INTAROS) will increase the desired impact, ensure cost-effectiveness and potentially help to attract external funding.

The training component is part of WP7 of APPLICATE. To optimize the efforts, a training plan prepared at the beginning of the project outlines not only the activities itself, but plans for their implementation as well as the expected risks and interdependencies.

### 1.2. Organisation of the plan

The training plan will first list the training activities planned for APPLICATE and discuss the procedure how they are planned. The content of these activities is subject to change during the planning phase. Afterwards the plan will discuss the risks and interdependencies and the implementation of the plan.

## 2. TRAINING PLAN

The APPLICATE training component includes both online and in-person activities throughout the project duration. Below we list a description of the activities and the responsible person within APPLICATE and APECS. While most activities are planned for a certain year during the project, task 7.3.2. will accompany the entire duration of the project.

### 2.1. Short-term activities (9 months to 1 year)

Activity	Leader	Procedure	Expected outcome
Training Plan	Gerlis Fugmann (UiT / APECS) gerlis.fugmann@apecs.is	The training plan is developed at the beginning of the project in discussion with the project partners in WP7 as well as consultation with the APECS and outside participants of the Year of Polar Prediction (YOPP) and the Blue Action project. The plan defines all the training activities, their time of execution and the overlap with other projects. The plan will be revised and updated during the lifetime of the project to	Training plan submitted in May 2017 (and updated in November 2019)

		reflect the ongoing planning progresses of the listed activities.	
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## 2.2. Mid-term activities (2 years)

Activity	Leader	Procedure	Expected outcome
Webinar Series	Gerlis Fugmann (UiT / APECS) gerlis.fugmann@apecs.is	A short webinar series of three webinars directed towards early career researchers (but open to the general public) was held from September 2017 to January 2018. These webinars introduced the APPLICATE project and increased awareness about the impact of Arctic changes on the weather and climate of the Northern hemisphere. While the first webinar provided an overview of the APPLICATE project as a whole, the following two webinars went more into details introducing some of the science conducted in the APPLICATE WPs (Atmospheric-ocean linkages; Improving Weather and Climate Models).	Webinars and webinar recordings submitted at the end of January 2019. The recordings were made available as an open resource on the APPLICATE and <a href="#">APECS websites</a> .
Summer School (Polar Prediction School)	Gerlis Fugmann (UiT / APECS) gerlis.fugmann@apecs.is	APPLICATE included a unique, high-level, summer school program for 30 PhD students and postdoctoral researchers, covering some of the theories and methods used within the research project. The 10-day training course was organized in from 17 - 27 April 2018 at Abisko Station in Sweden by UiT in cooperation with other projects and external partners (YOPP, APECS). The APPLICATE summer school (Polar Prediction School) was built on experience from the YOPP summer school in 2016 at Abisko Station. The archived course website with the schedule and all participants can be found on the <a href="#">APECS website</a> . All participants created FrostBytes (short 30-seconds videos) on their research projects (in connection to Task 7.1.4) which can be viewed on the course website or <a href="#">directly on Vimeo</a> .	Summer School, FrostByte videos

### 2.3. Long-term activities (4 years)

Activity	Leader	Procedure	Expected outcome
Online Course (MOOC)	Gerlis Fugmann (UiT / APECS) gerlis.fugmann@apecs.is	UiT will organize a 3-months online course on “ <a href="#">Advancing Predictive Capability of Northern Hemisphere Weather and Climate</a> ” in the form of a Massive Open Online Course (MOOC) from September to December 2019f or early career scientists (but open to anyone interested) with weekly interactive online sessions. The course is coordinated by the APPLICATE training manager at UiT with help from a team of volunteer APECS members and members of the APPLICATE project team. Lesson subjects will be identified by the APPLICATE team to cover a reasonable background to weather and climate prediction in the northern hemisphere (4 weeks), key aspects of data assimilation and modelling (4 weeks) and several key areas at the cutting edge of research in Arctic weather and climate predictability (4 weeks). Each week’s course activity will consist of a webinar lecture by a prominent scientist in a related area of research, reference information for a number of recommended reading items for students seeking a deeper understanding of the subject, and a short Quiz in Mentimeter to provide formative feedback and spark discussions during the ongoing webinar. The recorded webinars, links to further reading, the students` case studies and additional relevant information will be posted to the <a href="#">course webpage</a> and made openly available on the APPLICATE and APECS websites after the course concludes.	Online course and recordings. Resources including recommended reading and case studies
Follow up assessment of the outcomes of the learning experience	Gerlis Fugmann (UiT / APECS) gerlis.fugmann@apecs.is	A report will be produced assessing the training activities of the APPLICATE project and lay out lessons learned and recommendations to similar future projects. To achieve this and gain an objective evaluation of activities,	Assessment report

		<p>every training activity in APPLICATE will be immediately followed up with three surveys; one for the organizers of the activities, one for the mentors / lecturers of the activities and one for the participants. The surveys will be set up as a google form, as this will allow easy distribution of the survey and display of the results. The data received from this survey will be collected and provide the basis for the assessment report at the end of the project. The questions in the survey will include both Likert scale ratings of the activities, their planning, implementation and usefulness themselves, but also long-answer questions with option to give detailed feedback both on the reasons for the ratings and for recommendations on how to improve the activities in the future. The assessment report will contribute to improving training activities and teaching tools and strategies in future projects as well as APECS training activities. The assessment report will be published on the APPLICATE and APECS websites.</p>	
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### 2.4. On-going activities throughout the project

Activity	Leader	Procedure	Expected outcome
<p>Connection and training opportunities for early career researchers</p>	<p>Gerlis Fugmann (UiT / APECS) gerlis.fugmann@apecs.is</p>	<p>Networking tools for increasing connection and training opportunities for early career researchers will include:</p> <p>a) an email list: it was set up via the APPLICATE mailing list system for all early career researchers of the APPLICATE to use it as a platform for connecting with other early career researchers in the field of climate and weather prediction</p> <p>b) training webpage hosted on the <a href="#">APPLICATE</a> and <a href="#">APECS websites</a>: the was set up by the project manager at UiT and the Arctic Portal, and will be used throughout the project to compile materials derived from the APPLICATE training</p>	<p>Mailing list, webpage, report about mentor sessions</p>



		<p>activities and other interesting training resources relevant for early career researchers in the field of climate and weather prediction. This page is openly accessible and will be updated throughout the project.</p> <p>c) dedicated mentor sessions: throughout the project, APPLICATE in cooperation with APECS will be organizing mentoring discussions and networking opportunities for early career participants of the project at APPLICATE General Assemblies as well as providing the opportunity to include a minimum of two featured talks from early career researchers into the program. In addition, APECS will organize sessions at APECS workshops with for APPLICATE relevant transferable skill and thematic training topics that will connect early career and senior researchers. These sessions will be organized by the project manager at UiT as well as volunteers from APECS at meetings, workshops and conferences relevant to the APPLICATE project.</p> <p>A report will be written about each of these sessions contributing to the overall training assessment of APPLICATE (task 7.3.6.)</p>	
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### 3. RISKS AND INTERDEPENDENCIES

The risks associated with development of training materials are significantly lower than those associated with major research activities.

#### 3.1. Risks

Risk	Probability	Response	Responsibility
Unsuccessful hiring search for project manager position	Low	Extend or re-open the period for applications and seek additional advertising routes for the position and targeted recruiting. APECS volunteers will do their best to keep the school planning moving forward before someone is hired for the position	Gerlis Fugmann (UiT / APECS)

Low registrations for the summer school and online course	Low	Extend or re-open the period for applications and extend the reach for advertising the activities on social media and via research community relevant mailing lists	Gerlis Fugmann (UiT / APECS)
Website technical issues	Low	Coordinate with the website host (Arctic Portal) to solve issues	Gerlis Fugmann (UiT / APECS) / Arctic Portal
Technical issues with webinar platform during webinars and online course	Low	Organize training sessions with speakers before the event and provide a guide how participants can check their audio settings when logging into the system used (Zoom)	Gerlis Fugmann (UiT / APECS)
Delay in submitting deliverables or achieving milestones	Medium	The training team will work closely with the Management team of APPLICATE to ensure deadlines are being met and delays minimized.	Gerlis Fugmann (UiT / APECS)
Shortage of funding for summer school	Low	Seeking additional fundraising and / or adjust the number of participants and their travel funding amounts	Gerlis Fugmann (UiT / APECS)
Speaker cancellations in summer school, webinars and online course	Low to medium	Find additional speakers or replacements among the APPLICATE project partners or adjust the program or schedule of the activity	Gerlis Fugmann (UiT / APECS)
Logistical and weather problems during summer school	Low	Work with station manager to minimize risk. Adjust the program and planned activities as necessary (Steering Committee will plan backup activities for cases like this)	Gerlis Fugmann (UiT / APECS)

### 3.2. Interdependencies

The summer school was organized with input from the Year of Polar Prediction (YOPP) community. Specifically, members of the YOPP steering group organized a similar summer school at the same venue in 2016. Their experience and lessons learned were particularly valuable in efficiently organizing the 2018 school.

The online course will depend on input from other participants in the broader APPLICATE team. This input is not dependent on their research results, but rather on their expertise to help develop the course to cover the best possible set of subject areas for preparing students for this research area.

## 4. IMPLEMENTATION OF THE PLAN

### 4.1. Overall management of the training activities

The training activities listed in APPLICATE will be managed and implemented at UiT by:

- Dr. Gerlis Fugmann (WP 7 Training Leader and Executive Director of the APECS) who will be responsible for overall coordination and monitoring of the training plan and activities as well as supervision of the project manager at UiT and volunteers of

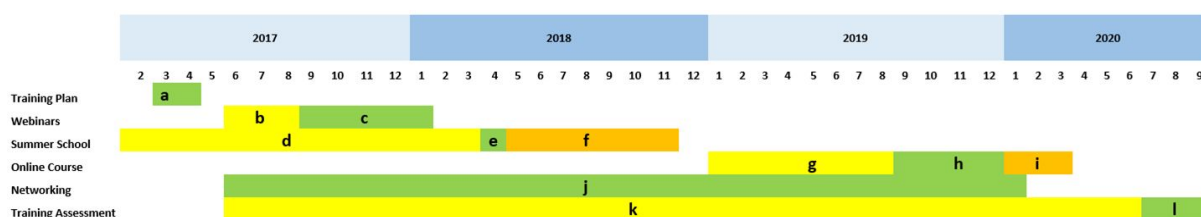
APECS.

- A project manager at UiT who was hired with project funds to assist with the implementation of the training activities in APPLICATE and will be supervised by Dr. Gerlis Fugmann. The project manager position was filled from October 2017. The position had to be re-hired in October 2018 due to the initial person moving on to another position.
- Volunteers (all early career researchers) from APECS who will participate in several aspects of the planning and implementation of specifically the webinar series, the summer school and online course assisting the project manager and Dr. Gerlis Fugmann. The volunteers will be coordinated by the project manager at UiT and supervised by Dr. Gerlis Fugmann.

The project manager at UiT and Dr. Gerlis Fugmann will ensure regular reporting of training activity results as well as preparation and delivery of training deliverables to the other WP 7 partners and the APPLICATE Project Office and Project Leader. Changes to the training plan will be included and coordinated with the APPLICATE Project Office and WP7 partners as the detailed planning of each activity progresses. The plan will therefore be updated during the lifetime of the project as needed.

### 4.2. Detailed Implementation of Activities from the Training Plan

The timeline below shows the different phases of the implementation of each training activity:



- a) Training Plan preparation
- b) Webinar preparation phase
- c) Webinar phase (one per month)
- d) Summer School Planning phase
- e) Summer School
- f) Post-Summer School phase (financial wrap-up, report writing)
- g) Online Course planning phase
- h) Online Course (12 sessions)
- i) Post-Online Course phase (wrap up with participants and speakers, uploading of course material, reporting)
- j) On-going networking activities
- k) Preparation of and data collection for training assessment
- l) Writing phase of training assessment

#### 1) Webinars (Task 7.3.3.)

The planning for the webinars started in June 2017 and the speakers were sought among the project partners of APPLICATE. Speakers were invited based on their expertise in the topics of the webinars. International as well as gender diversity was carefully considered in the selection of the speakers. The webinars were advertised starting late August 2017 through the APPLICATE and APECS channels. The webinars were held on:

- 28 September 2017
- 29 November 2017

- 9 January 2018

Attending the webinars was free. To ensure the APPLICATE branding of materials, the presentations used the APPLICATE power point template. Each webinar was recorded and made available online afterwards, with the last webinar recording being added on the APPLICATE and APECS websites at the end of January 2018..

## **2) Summer School (Task (7.3.4.)**

The planning for the summer school started in February 2017 with initial calls of the organizing team members. The summer school was organized jointly between APPLICATE, YOPP and APECS with involvement of other relevant partners.

The project manager at UiT assumed responsibility for most of the logistics of organizing the school. Before the school, these include site arrangements and reservations, coordinating supplemental fundraising, advertising for the school, soliciting applications, and managing communication with both students and mentors.

The full steering committee was assembled in May 2017 to advise on refinements to the syllabus (see the final version on the [archived school website](#)) and recruiting speakers for the school. The steering committee included members with diverse scientific background and attention was given to gender balance.. Speakers were invited based on their expertise in the topics of the school. International as well as gender diversity were carefully considered in the selection of the speakers. The steering committee developed the content for the evening sessions on transferable skill and career development.

Advertisement for the school and application phase for participants started in June 2017 with the application deadline in mid-September 2017. In total about 100 applications were received. Applicants were reviewed and selected by the steering committee based on their application material using a set of selection criteria (including educational and scientific background) developed by the Steering Committee. Country balance as well as gender diversity were carefully considered in the selection of the participants. Successful applicants were contacted in October 2017. Travel support was provided to participants as available.

A webpage for the summer school was set upon the APECS website and linked to from the APPLICATE website. The page was updated throughout the planning phase of the school and included all information needed for participants and speakers including (but not limited to) program, speaker and participant biographies, registration form, logistics information for participants and speakers, training material needed for participants for preparation of attendance and theFrostByte videos from the participants (task 7.1.4)..

From November 2017 to March 2018, the main activities were final logistics arrangements and travel arrangements coordination with participants and speaker, coordination of the production of FrostBytes videos from the participants, updates to the summer school website and further refinements of the program as needed.

The summer school itself was held from 17 - 27 April 2018. After the summer school there were several months of follow up activities both on travel reimbursements and reporting. In addition, a follow-up survey was performed among the participants and speakers, the data of which will be used both for the summer school report and the final training assessment of APPLICATE. The [final summer school report](#) was published in May 2018.

### 3) **Online Course (Task 7.3.5.)**

From September to December of 2019, APPLICATE and APECS are running an online course titled “Advancing Predictive Capability of Northern Hemisphere Weather and Climate”. The course had to be moved by a few months (originally planned for January to March 2019) due to the re-hiring of the project manager at UiT in fall 2018 and needed preparation time for the new project manager.

Planning the online course started in early 2019. A committee consisting of the project manager at UiT, volunteers from APECS, and members of the APPLICATE project team with subject matter expertise drafted the syllabus for the class, keeping in mind that students will be coming from diverse backgrounds and varying degrees of preparation for the course. The syllabus was refined over the summer 2019 with the input from the APPLICATE scientists.

The course provides an overview of the state-of-the-art knowledge of Northern high-latitude weather and climate prediction; including aspects relevant for the Arctic climate system; and linkages between Arctic and mid-latitude/global weather. The topics include an overview of the observing system design in the Arctic, current methods in weather and climate predictions, and how predictive skills can be improved. An important aspect of the course are Arctic extreme weather phenomena and engagement of stakeholders who are using weather and climate predictions in their daily operations.

Eight of the lecturers are part of the APPLICATE consortium. The live versions of the webinars allowed interaction between the speaker and the audience, with time for questions and discussion. In addition, each webinar has a Quiz and/or competition in Mentimeter with three questions to provide formative feedback and spark discussions during the ongoing webinar.

For each week of the course, there are 1-3 recommended readings, consisting of textbook chapters, academic papers, assessment reports, or other relevant documents. Each week a guest lecturer delivers a lecture via webinar on the topic for the week.

In addition, course participants are working in small groups preparing a practical task related to stakeholder engagement. The groups are writing case studies focused on extreme events of Arctic weather and climate on different scales, and their impact on specific aspects of society or daily life in the Arctic and beyond. The topics were selected in cooperation with the partners of WP7 in APPLICATE modelled around the [case studies produced](#) by APPLICATE. The topics for case studies for the online course were:

- Renewable energy:
  - Case Study E1 - Renewable energy production in the Arctic
  - Case Study E2 - Icing on wind parks
- Health in the Arctic
  - Case Study H1 - Heatwaves & fires
  - Case Study H2 - Human health and comfort
- Safety / Insurance issues in the Arctic
  - Case Study S1 - Future risks for hazards
  - Case Study S2 - Heat and rockfalls
- Biodiversity and conservation
  - Case Study B1 - Sea ice and biodiversity
  - Case Study B2 - Climate variables and marine biodiversity
- Local infrastructure

- Case Study L1 - Local infrastructure and rain on snow events
- 

They course participants perform an internal peer-review exercise before they present their outcomes in a dedicated webinar in December 2019 and their project reports will be made available afterwards on the course website.

The goal of this course is to provide students with the context and understanding necessary to contribute to research on weather and climate prediction. The course will be freely available to anyone interested while it is being run live, and the archived course materials and recordings will stay available online after the conclusion of the course.

#### **4) Networking Tools (Task 7.3.2.)**

Networking tools for increasing connection and training opportunities for early career researchers are seen as important and therefore the APPLICATE project will provide the following tools:

**a) Email list:** This list will be set up via the APPLICATE mailing list system for all early career researchers in APPLICATE as a platform for distributing information about the training activities to them and for them to connect with other early career researchers in the field of climate and weather prediction. The APPLICATE project office will maintain the list throughout the project lifetime.

**b) Training webpage hosted on the APPLICATE and APECS websites:** The pages were set up by the project manager at UiT and the Arctic Portal, and will be used throughout the project to compile materials derived from the APPLICATE training activities and other interesting training resources relevant for early career researchers in the field of climate and weather prediction. This page is openly accessible and will be updated throughout the project. The project manager at UiT and the APECS International Directorate Office will be maintaining and updating the page throughout the duration of the APPLICATE project.

- APPLICATE training website on the APECS website:  
<https://www.apecs.is/research/apecs-projects/applicate.html>
- APPLICATE training website on the APPLICATE website:  
<https://applicate.eu/training/training-strategy>

**c) Dedicated mentor sessions:** Throughout the project, APPLICATE in cooperation with APECS will be organizing mentoring discussions and networking opportunities for early career participants of the project at APPLICATE General Assemblies as well as providing the opportunity to include a minimum of two featured talks from early career researchers into the program. In addition, APECS will be organizing sessions at APECS workshops with APPLICATE-relevant soft skill and thematic training topics that will connect early career and senior researchers. These sessions will be organized by the project manager at UiT as well as volunteers from APECS at meetings, workshops and conferences. Reports from the sessions and possible training material or powerpoint slides from speakers will be made available on the APECS and APPLICATE websites.

#### **5) Training Assessment (Task 7.3.6.)**

An assessment report will be produced assessing the training activities of the APPLICATE project and lays out lessons learned and recommendations to similar future efforts. To achieve this and gain an objective evaluation of activities, every training activity in APPLICATE will be immediately followed up with surveys for the organizers of the activities, the mentors / lecturers of the activities and the participants. The surveys will be designed by the project manager at UiT. Google forms will be used as the platform for the survey as it will allow easy distribution of the surveys and display of the results.

After each training activity, the project manager at UiT will send out the survey to the relevant target group. The survey data will be collected and archived by the project manager. It will provide the basis for the assessment report at the end of the project.

The questions in the survey will include both Likert scale ratings of the activities, their planning, implementation and usefulness themselves, but also long-answer questions with option to give detailed feedback both on the reasons for the ratings and for recommendations on how to improve the activities in the future.

The assessment report will be written in the last year of the APPLICATE project by the project manager at UiT in cooperation with the Dr. Gerlis Fugmann at the APECS International Directorate Office. The report and its results will contribute to improving training activities and teaching tools and strategies in future project as well as those of APECS. The assessment report will be published on the APPLICATE and APECS websites by September 2020.

## 5. REFERENCES

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## 6. ACRONYMS

APECS	Association of Polar Early Career Scientists
PPP	Polar Prediction Project
UiT	UiT The Arctic University of Norway
YOPP	Year of Polar Predictions