Paulina Hellgren, SMHI

Training Development Plan

PMU (Practical Meteorological Course)

Overview

Two of the Universities in Sweden that are offering an education in meteorology are MISU in Stockholm and MIUU in Uppsala. The Universities easily manages to teach all the theoretical parts of the meteorological subjects, but when it comes to the practical part they need help. As we, at SMHI and also the Swedish Air Force (SAF), are interested in minimizing the training at the work place we have agreed to arrange the final practical course at the University. This means that SMHI is responsible for a 10 weeks course (15 hp) in practical meteorology that is offered half the time at MIUU and half the time at MISU. This is also a way of saving a bit of money for everybody as we join students from both Universities at the same course.
This course takes place once a year in spring.

The course provides an overview of and insight into the working material a forecaster uses in practice. This includes:

- Meteorological observations and observing systems
- Analyzes at different levels in the atmosphere
- Interpretation of various types of NWP products
- Methods to include meso-scale effects in a weather forecast
- Conceptual models for weather systems
- Meteorological remote sensing for forecasting
- Customizing

Audience

The Primary audience are meteorology students at the Universities in Stockholm and Uppsala. It is possible to apply for the course even if you, at present, are not a student at MISU or MIUU, but have the qualifications mentioned below.
The prerequisite knowledge needed for this course corresponds to 90 hp in meteorology.

Learning Needs

As SMHI is one of the largest employer of forecasters in Sweden we have an interest in the training that the meteorology students have gone through at the University. We also have regulations from WMO to take into account regarding forecasters operating at SMHI. This makes us very interested in the content of a practical course to help the students a bit on the way to become a forecaster at work later on.
By being responsible for this practical course we can steer the content towards what is most needed to learn at this point of their education. This minimizes the amount of training we have to deliver later on at the work place.

After taking the course, students should be able to:

- conduct a manual analysis of a weather situation and do a manual short term forecast
- use selected conceptual models to analyze a weather situation and make a simple forecast
- analyze NWP forecasts and interpret the results and evaluate their reliability
- use remote sensing systems as a forecasting tool
- use forecasting methods on the meso-scale
- write and formulate different kinds of weather forecasts and other weather information to different customers

Performance/Learning Outcomes

- Job competencies to be addressed by the training:
    - Analyze the weather over Scandinavia.
    - Make a short term land forecast (area Sweden).
    - Formulate an aeronautical forecast, forecast to a newspaper, radio, TV.

- Desired learning outcomes of the planned event, written as measurable learning objectives:
    - Analyze, interpret and utilize remote sensing systems in identifying and diagnosing various weather systems.
    - Analyze, interpret and utilize NWP products to aid in preparing a weather forecast.
    - Use the correct wording when communicating the weather forecast to a customer or the public.

Content Scope

The course will have the following contents:

1. Observation Systems and Remote Sensing
    a. Observations
    b. Satellite
    c. Weather Radar and lightning tracker
2. Analysis and nowcasting
3. NWP
4. Forecasting methods on the meso-scale
    a. Wind phenomenon: mountain and valley winds, sea breeze
    b. Interpretation of thermodynamic diagrams
    c. Stratus and fog
5. Conceptual models
6. Customizing
    a. Weather language
    b. Forecast formulation
    c. Land and sea weather
    d. Aeronautical meteorology
    e. Central alert service
    f. Meeting with media
7. Practical examination

Constraints

It is a university course where the needs of two universities; Uppsala (MIUU) and Stockholm (MISU) universities, has to be prioritized. At the same time SMHI is the part delivering the course since we have the most skilled personnel in this area practical meteorology. The goal for the students is to pass the exam which covers the learning needs.

- Budget:

  Since the universities don't have an orientation towards forecasting (they are focusing on research) they haven't got much money to set off for this course. I.e. they can't pay more than the cost for a usual course at the university where they use their own (cheaper) staff. This means that SMHI has to cover the rest if the cost is higher. This year the budget is 199 hours of teaching for teachers coming from outside the universities (450 hours including preparations). In addition to this it is possible to use assistants (PhD students) when needed/possible. They are paid by the universities themselves and not a cost within the budget. Within the budget we also pay for teachers coming from the Swedish Air Force (SAF).

  The Universities also pays for all the travels/hotel nights/per diem for the teachers.

  Classrooms (with computers) are provided in both Uppsala and Stockholm and are not a cost for the budget.

  All time used by Paulina Hellgren (responsible for training activities at SMHI) for preparing the course and the website, facilitate teachers and students before and during, prepare material for self-tutored exercises/PhP students exercises etc is outside the budget and up to her to fit in to her other duties.

- Time:

  It is a 10 weeks course, starting March 23rd and ending with a practical exam on June 5th. Half the course will take place in Uppsala and half in Stockholm with start in Uppsala. The students will travel between the universities.

- Participants:

  If you live up to the qualifications needed (90 hp in meteorology) you may participate in the course. This year we will have 11 students taking the course.

- Facilitation:

  The course is in Swedish. Teachers come from SMHI, SAF and for some easier task we use PhD students. Since there are many different topics taught at the course we have to use many different teachers. Many teachers work forecasting shifts, travel to conferences or have other training events/workshops to attend etc. When preparing the schedule you have to take into account when the different teachers are available and at what time they can be in the classroom if they travel from southern/northern parts of Sweden and so on.

- Content expertise:

All teachers have very good meteorology content expertise.

- Projekt risks:

  The time included in the budget for preparations for lessons is very limited. This means teachers probably will have to reuse old/other teachers' material to some extent.

  Teachers are mainly taken from the forecasting units or research departments at SMHI which means that they don't have much skill in training. They are self-tutored in that area and do their best. Although they really know the topic.

  Neither students nor teachers are familiar with distance learning courses for gaining work skills. But we will try some facilitating over video/Forums to get as much exercises as possible into the course and keep the teaching hours to 199. There will be exercises where the students will work in groups to discuss with each other and present/discuss their conclusion/ideas with a teacher afterwards.

  Difficult to replace a teacher who becomes ill on his/her day.

Learning Solutions

- It will be mainly a 10 weeks classroom course with a lot of practice during lessons and the help of a simulator where students can train in some lessons. There are several reasons for this:
  - Trainers are oriented more toward classroom approaches. They may be unsure about distance learning.
  - Students have not used distance learning, and may be uncomfortable using it.
  - We have classrooms set up at the universities and the students easy get to both Uppsala and Stockholm universities. As well as teachers who are spread out in the country.
  - Training will require a lot of practical exercises to prepare participants for making forecast decisions. Communication skills (issuing forecasts) are also important. Guidance for these exercises by experts is useful.
- Some of the exercises the students may do at home or in groups in the classrooms helping each other. In the afternoon a teacher will be available over video for an hour to answer questions that come up during the day and which the students have not been able to solve within the group. For some cases we will use the Forums available in the course web site.

Learning Assessment

- Initial assessment

  There will be no initial assessment of the students, but we have studied the contents of the courses they have studied at the University so far, and planned our course after that, keeping in mind they are all new to the practical part of meteorology. Some overlap is ok, but not too much. But "repetition is the mother of learning" – or something like that…

- Formative assessment

During the course we will have a few larger exercises/assignments the students have to complete. Not like a test but to practice the theory learnt. That is analyzing, interpreting remote sensing products and so on. There is always a teacher to discuss with and they don't mark the exercises. The students just have to complete them. This is both for the students to understand what they need to practice more and for the teachers to know what to focus on next.

There will also be a kind of evaluation towards the middle of the course for students to comment on the course outline, trainers, facilities, and so on. This helps us if there is something we have to change right away in the planning.

- Summative assessment

  Since this is a University course we have to end the course with an exam. Previous years this exam has been quite detailed and the students have studied the last days for this. But since this is a practical course we want the students to understand what they are doing and not just memorize details. Instead the students are supposed to practice until they master the expected Learning Outcomes. The exam will mainly focus on the highest levels in the Bloom's Taxonomy. The exam will consist of two parts.
  - Oral exam:
    The students get an hour to write a text forecast (for example for a radio station) given a certain material that they get when the exam begins. When the hour has passed they present their text orally to the examiner who asks questions about their reasoning and why they wrote in a certain way etc. The focus here will be on the structure and content, not on the actual text itself.
  - Written exam (something like this):
    - Make a weather analysis for the chosen situation (map area Scandinavia).
    - Make a rough, synoptic 6-hour forecast without NWP material (formulate motif).
    - Create a slightly more detailed land forecast for Götaland / Svealand / southern or northern Norrland (formulate motif).
    - Formulate an aeronautical forecast for a certain airport in the selected area (formulate motif).

  Both the oral and the written exams will be graded by an examiner at the University.

- There will also be an evaluation towards the end of the course both for students and teachers. This will be a great help when planning future courses or a follow up to this one.

Training Evaluation

- As mentioned above, the course ends with an oral and a written exam as assessments of learning.

- There will be an evaluation towards the end of the course both for students and teachers. This will focus on Kirkpatrick level 1 and will be a great help when planning future courses or a follow up to this one. We will also have a midcourse evaluation for the students to answer, so we know if we are on the right track or if we should changes something in the course plan.

- Besides the written evaluations (questionnaires) I will talk to both students and teachers during the course to find out if they are satisfied with the layup or if they propose any changes. I want the atmosphere to be relaxed so everybody dare speak out their minds.

Learning Activities

The major learning activities that will be included:

- Case studies using real-time and past situations (mainly in paper form) will be used primarily to let the students work with reality. All new themes will start with/include necessary theory for the topic. In the beginning of the course the case studies will focus on analyses including everything about observations, radar, satellites etc. After a few weeks the course turns towards nowcasting with case studies on that and smaller exercises within. Towards the middle of the course the students will learn and practice on the different needs/focus for different end customers. And also to deliver the forecasts in different styles (radio, TV, newspaper etc). Here we will use case studies and smaller exercises. The students may also listen to/join the daily weather conference over the phone, held from SMHI.
- Towards the end of the course when the students have practiced a lot and learnt much of the theory we will let them try out two different computer-based Simulations (past situation) to create a short forecast.
- In the beginning of the course all exercises are led by a teacher. Towards the end of the course many exercises are started up by a teacher and then the students are supposed to work in groups to help each other out and to learn from each other. They have a possibility to use a forum if they have questions for a teacher and towards the end of the day the teacher is either in the class room or over the web to discuss the result and answer questions from the students.

The roles of the trainers during the training:

- Introduce the learners to (and guide them through) each subject and make sure the students understand what and why they are doing like they do.
- Try to make the training as authentic as possible.
- Give feedback
- Be sure that teaching becomes learning.

The roles of learners during the training:

- Read and review content resources to gain the necessary knowledge.
- Actively participate in learning activities to practice and learn.
- Seek guidance and feedback from trainers to improve on their competences.
- Engage themselves in group work to help each other out.

Resources

Human Resources

SMHI

- Paulina Hellgren - course leader
- Erik Kjellström - assessor
- Leif Hallingfors – observations
- Günther Haase - radar
- Anders Wettergren – analysis
- Ulf Andrae - models and verification
- Magnus Lindskog - data-assimilation
- Björn Stensen - EPS
- Bengt Lindström - warnings, weather language, land- and sea forecasts
- Esbjörn Olsson - wind forecasting and road forecasts
- Erling Brännström - NWP and delivering radio forecasts
- Lars Elgeskog - NWP

- Gustav Åström - fog/stratus
- Emil Björck – convection
- Lisa Frost - delivering media forecasts
- Mats Andersson - probability forecasting and delivering TV/radio forecasts
- Stina Kihlgren - analysis, nowcasting and aviation forecasts
- Sara Brattström – marine forecasting
- Anna Krahner – delivering 10-days text forecasts

MIUU

- Erik Sahlée - headmaster for studies
- Jennie Söderman-Persson - postgraduate

MISU

- Solveig Hauser - secretary/assistant

SAF

- Sofia Söderholm - conceptual models, TAF, METAR
- Per-Ola Jakobsson – NWP, nowcasting

Additional teachers

- Pia Hultgren, SVT - satellite
- Tomas Mårtensson, FOI - convection, icing
- Monika Lakomiak, Foreca - forecasting

Content Resources

- See below under Learning Resources and Tools

Learning Resources and Tools

- Classroom for 10 students equipped with a projector
- Laptops connected to the internet to be able to use all resources
- Moodle site of EUMETCAL. There we will upload all information regarding the course: objectives, schedule, participants, info regarding the exam, Forum, presentations, simulators, evaluations, any extra material
- For a few online sessions/presentations where the students will sit in the classroom, the teacher will be joining via Skype
- Pens in different colours to analyze weather charts
- Listen to/join the daily weather conference over the phone, held from SMHI
- SMHI Produktportal; a weather portal where the trainees will have access to real-time data, NWP products from various centers and observations, radar, satellite etc
- Modules over the internet for learning about for example conceptual models and verification
- Simulators for authentic weather forecasting
- Presentations/case studies/exercises created by the teachers

Milestones and Schedule

Activity	Deadline

1. Project Plan completed	Autumn 2014
2. Learning needs assessed	Autumn 2014
3. Learning outcomes reviewed and approved	Autumn 2014
4. Scheduling of human resources	December 2014
5. Scheduling of technical resources	March 2015 as during the course for later sessions
6. Scheduling of facility resources	February 2015
7. Content outline developed	December 2014
8. Final course content developed	Middle of March, 2015, as during the course for later sessions
9. Learning resources developed or adapted	March 2015
10. Course begins	March 23rd 2015
11. Exam date	June 5th 2015
12. Training evaluation complete	Second week of June 2015