

Future developments

Next generation training methods

The new generation of training methods include such developments as e-learning, blended learning, serious gaming and training with the help of 4D tools.

Introduction

About 15 years ago within the meteorological training world we were talking about CAL, or Computer Aided Learning. The CAL module was a course or training in which the multimedia training material was offered to the trainee via a computer. The training material came on CD-ROMs and had no links to external sources. The computer used had no connection to a network. Nowadays we are talking more about e-learning which is basically the same as CAL, but we use training material from sources online.

E-learning

E-learning is associated with learning activities which make use of the interactive possibilities of computers connected to a network. The computer network can be used to distribute the material, communicate between the trainer and the trainee and to facilitate the course. E-learning is a good method to make distance learning possible because it makes learning independent of time and place. E-learning is aimed at:

- The learning process itself: both individuals and groups
- The development and control of training material and training processes
- The organization of learning activities

Blended learning

Blended learning is a mixed course in which two different types of training are used, usually:

- An online phase with distance training and
- A residence phase with classroom lessons

For the online phase the trainer uses e-learning material and, apart from the online classroom lessons, the trainees can work at their own location and in their own time with the material given by the trainer. After two or three months of virtual life, teachers and students finally gather for the classroom session. Thanks to the distance phase the trainees have a solid and common background understanding at the moment the trainer starts with the classroom phase. The classroom phase is like a large real-life forum and is a natural continuation of the virtual distance phase.

Serious gaming

Serious gaming is a simulation exercise which can have the look and feel of a game, but corresponds to non-game events or processes. The serious games (simulations) provide an engaging, self-reinforcing context in which to motivate and educate the players. Well known examples include train or flight simulators. KNMI has developed simulation modules for its maritime forecasters and for people at the Storm Surge and Warning Centre within the Netherlands.

3D and 4D visualization tools

At KNMI we have started to explore our 3D numerical weather prediction model, called HIRLAM, with the help 3D visualization tools and virtual reality. We found that exploring atmospheric models with the help of 3D visualization and virtual reality helps to improve our insights into atmospheric structures and the underlying atmospheric processes.

Advantages and disadvantages of these training methods

Advantages of e-learning:

The trainees have flexibility in training possibilities because the material is personalised and available 24/7. And they can do their training at self-chosen moments and places. The organization can save costs as no travel time, travel costs and accommodation expenses are required for the training. There are many sources available with very good training material made by experts or you can repurpose existing training material to create your own training.

Disadvantages of e-learning:

Learning and reading from a screen is tiring and the trainees need to be open to this type of individual education. They need to have self-discipline and cognitive skills for this type of training. The danger is that the trainee is not learning consciously but only works through the training material without the learning process having a lasting effect. When working with international e-learning solutions language may be an extra barrier and the training material is not tailor-made for the particular area or learner.

Advantages of blended learning:

Blended learning makes it is easier to work with international groups. Just as with e-learning, your organization can train their people with the help of experts and it can save costs. A local trainer doesn't have to give training outside his expertise area and the organization is saving money because their trainees have to spend less time on travel and have limited travel and accommodation expenses. The online distance phase is used to bring the knowledge level of the trainees to the same level before the classroom phase starts. This makes it possible to handle more advanced material during the classroom training.

Disadvantages of blended learning:

Problems that occur during blended learning courses mostly occur during the distance phase. The distance phase is vulnerable to technical problems. You work with different local times, especially if people from different continents participate. This makes the distance phase an individual phase and the trainees of your organisation should be able to cope with it.

Advantages of serious gaming:

Training with serious gaming and/or simulators allows the possibility to bringing people very close to the reality of extreme situations and to train them in new skills. Research has shown that training skills with the help of simulators works more effectively than the more traditional way of training. It also allows you to train close to reality without disturbing your operational working process. Furthermore serious gaming can be used to simulate emergency situations which are too costly and too complex to simulate otherwise.

Disadvantages of serious gaming:

Traditional simulators were very expensive and needed specialised hardware. But the developments in this area are very rapid and the first available and affordable solutions are there. People who are not used to this way of training find this way of training a little overwhelming the first time. So preparation time can be needed.

Advantages of 3- and 4-D visualization tools:

As stated before, exploring weather prediction models with the help of 3D visualisation and virtual reality helps the scientists to get a better insight in the processes going on in their models. At the moment within KNMI we try to use this new technique to create a physical learning environment for modellers and forecasters where they can gather and learn from each other. Next to the models KNMI want to put observations like radar and satellite imagery into the system. The 3D visualization and virtual reality technique is still in a development stage, but in the future might be very valuable to train the next generation of meteorologists and forecasters .

Disadvantages of 3- and 4-D visualization tools:

To undertake 3D visualization with virtual reality requires significant investment in workstations, special projectors and special projection screens. A permanent set up of these tools in a separate room saves considerable time and effort. The danger of working with 3D visualization and virtual reality is that the virtual world will be mixed up with the real world.

Organisations developing this type of training

Internationally there are several groups developing training material for various target audiences within meteorology. Worldwide, these groups gather once every two years at the CALMet conference (<http://www.calmet.org/index.htm>). Within Europe, EUMETCAL (<http://www.eumetcal.org/>) works on and develops the new generation of training tools. EUMETCAL is financed by EUMETNET and EUMET-SAT and in the past years it has extended through affiliations from COMET from the US, the Meteorological Service of Canada and the Bureau of Meteorology of Australia. The EUMETCAL community gathers annually. More information on the new generation training material can be found at the above named groups and examples of training material can be found on the above named websites and on <http://www.meted.ucar.edu/index.htm>. Clicking through the various websites with their modules shows the development of the new generation e-learning training material during the past years.

The MetEd website has some modules on mesoscale meteorology and EUMETCAL is well known for its experience with blended learning.

The use of 3D visualisation and virtual reality described here has been developed at KNMI and has not been distributed elsewhere yet, but you are welcome to visit us and experience this new way of working.

Techniques used for the new generation training material

In the world of CALMet and EUMETCAL the open source course management system Moodle is frequently used to create a training platform for their students. Moodle can also be used as a tool to create online dynamic websites. Nowadays most of the new e-learning modules are made with Adobe Flash or a combination of Adobe Flash (for the interactive elements) and HTML (for the simple plain text). For the group lessons during the online phase of EUMETCAL training with blended learning course packages like Saba Centra, Elluminate and Skype is used.

As Adobe Flash and ActionScript (its programming language) are generally found not to be the easiest computer environment to work with it might be advisable to take a local course in Flash and ActionScript to start with. For Moodle there is considerable documentation available on the web and in books. And when this is not enough, within the EUMETCAL network courses and workshops are given on how to work with Moodle, Adobe Flash and Centra or Elluminate.

Examples

As already mentioned, the advantages of e-learning are that people can learn at a moment that is most convenient for them and learn at their own pace. The training can be dedicated in the sense that specific courses can be selected which are most appropriate in relation to the existing knowledge of the trainee and the specific task the trainee has.

In Figure 1 a screen dump from <http://www.meted.ucar.edu/> shows information on horizontal resolution in the module “How mesoscale models work”. The trainee can ask for more background information or continue the course when he or she is ready.

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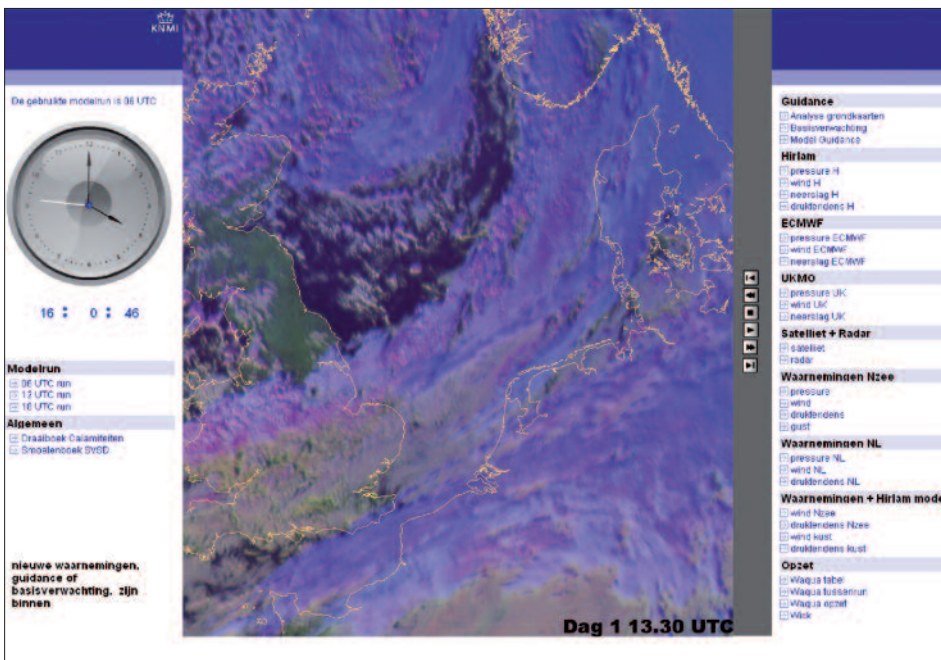


Figure 1: Example of The Simulator as it is used at KNMI for training Maritime Forecasters and people at the Storm Surge and Warning centre0

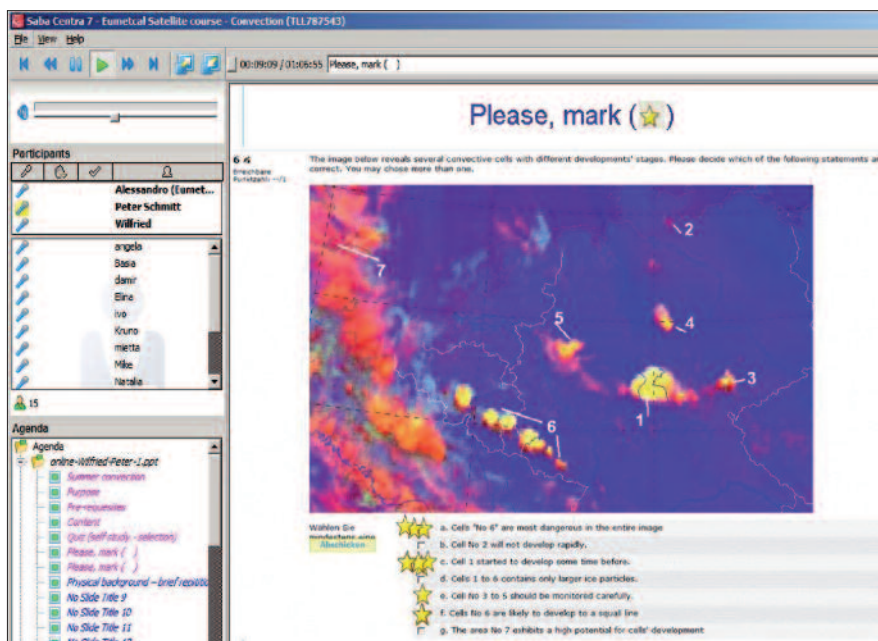


Figure 2: The blended learning phase. The top picture shows the online phase with a Centra meeting running on the desktop. The bottom picture shows the residence phase with a classroom lesson (picture taken from an EumetCal PPT presentation).

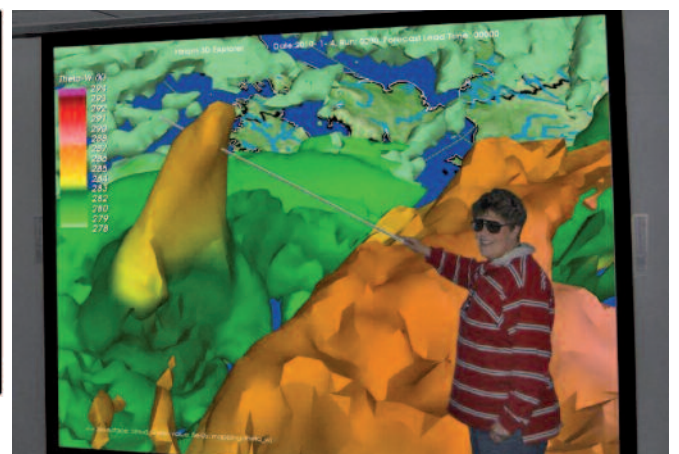
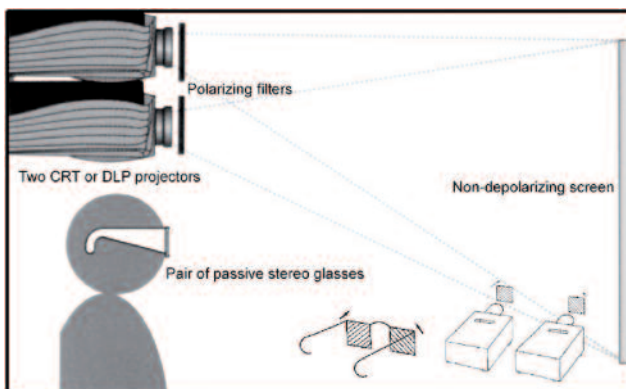


Figure 3: The virtual reality laboratory at KNMI. The top picture shows the setup. In the middle picture people with passive depolarizing glasses are looking into the virtual world (picture taken by Maarten Sneep at the KNMI science day). The bottom picture shows the instructor explaining a mesoscale feature in Theta-W forecast field (picture taken by Michal Koutek).