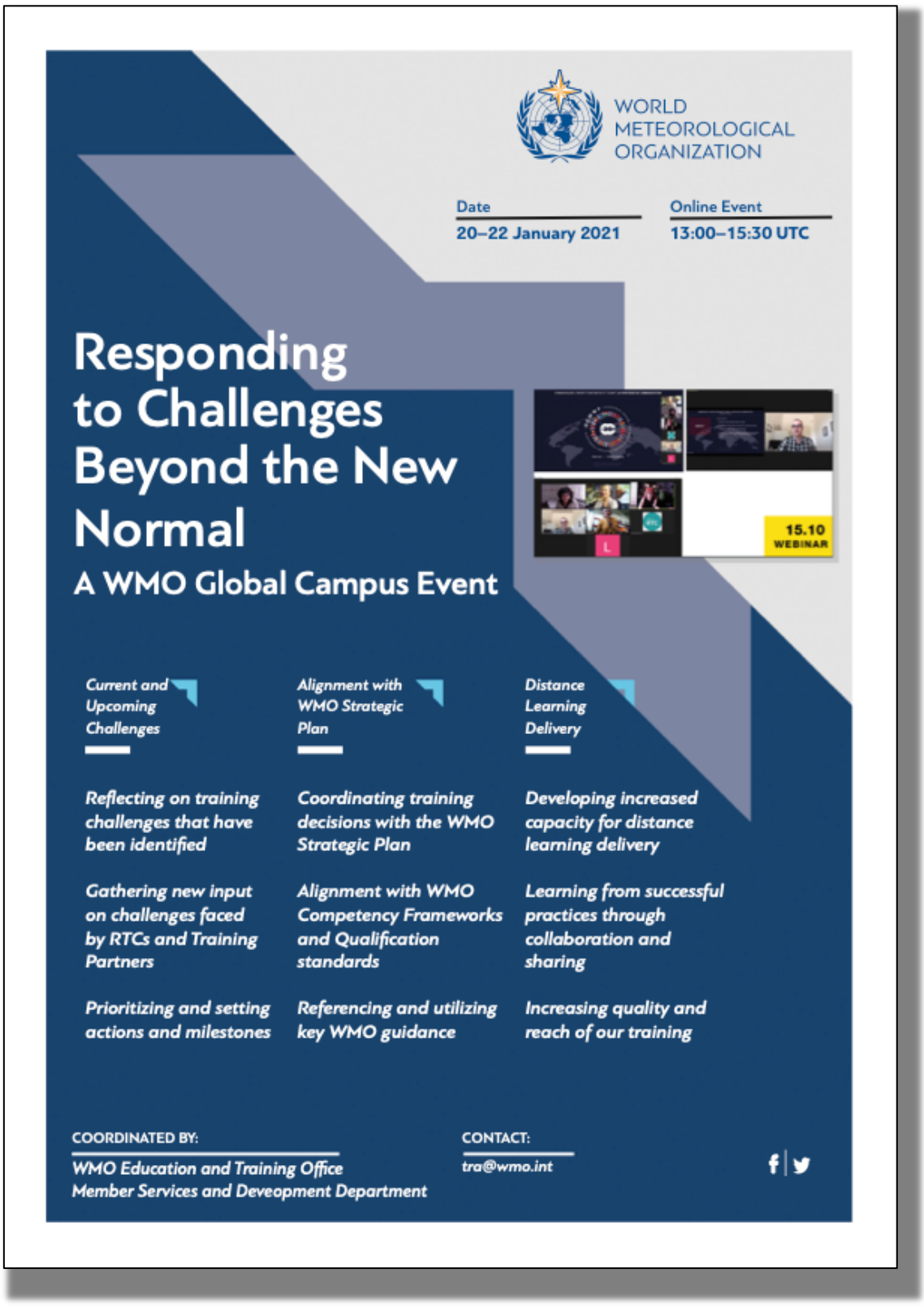
Proceedings
Responding to Challenges Beyond the New Normal
A WMO Global Campus Event



Proceedings of

Responding to Challenges Beyond the New Normal:

A WMO Global Campus Event

The WMO Global Campus Event, **Responding to Challenges Beyond the New Normal,** was held from 20-22 January**.** Invitations to the event were sent to Director of the WMO Regional Trainer Centers and their staff members, other key WMO education and training partners, WMO National Education and Training Focal Points, and the WMO Secretariat technical departments, regional offices, and all Member Services.

In brief, these were the intended activities and outcomes of the event indicated in the invitation:

- Orient education and training partners of WMO, including RTCs and others, to the new WMO Strategic Plan, and their role in fulfilling it.
- Make education and training partners aware of the capacity development priorities of the WMO Secretariat Technical Departments, as well as the contributions they can make to meeting these priorities
- Share resources available from WMO to our education and training partners to help them in their response to new requirements of the current pandemic and also the increasing education and training needs for NMHSs in a changing world.
- Education and training partners share their greatest challenges they would like to have assistance or advice in addressing by the WMO Global Campus community.
- Share reports of participating education and training partners on their strategies for addressing the recent challenges of the pandemic.
- Allow smaller breakout groups time to discuss strategies for addressing the most critical challenges and establishing courses of action for additional work.
- Share the above results in a Proceedings, which will provide significant input for SYMET-14 to be held later in 2021.

Day 1: Welcome Addresses, WMO Strategic Plan and WMO Capacity Development

One of the key outcomes described in the announcement of the WMO Global Campus Event was "Alignment with the WMO Strategic Plan." This was announced in the invitation and event flyer as including (a) Coordinating training decisions with the WMO Strategic Plan, (b) Alignment with WMO Competency Frameworks and Qualification standards, and (c) Referencing and utilizing key WMO guidance. This outcome was primarily addressed during presentations and discussion on Day 1, 20 January 2020. All presentations offered in the form of PowerPoint are available on the meeting website at https://etrp.wmo.int/mod/page/view.php?id=16424&forceview=1.

Opening Remarks

1. The meeting was initiated by a welcome of the Event Chair, **Dr Winifred Jordaan** (SAWS, EC Capacity Development member). She expressed her pleasure to be working with all the participants in this valuable event, and highlighted the expected outcomes of the meeting.

2. This was followed by a welcome of **Ms Mary Power** (Director, WMO Member Services Department), representing the WMO Secretary General. In her welcome, Ms Power noted that meetings with our WMO training partners are extremely valuable for coordination and collaboration, especially because WMO relies so heavily on its Member's education and training institutions to achieve its goals and objectives in regard to global capacity development, which is at the core of WMO's mission. She noted that meetings of these institutions offer chances for collaboration that help raise the level of our education and training impacts by highlighting shared goals and challenges, as well as solutions to meeting them. She noted that 2020 had been a particularly challenging year due to the unprecedented COVID-19 pandemic and the quarantines it imposed, but acknowledged that that human resources capacity development is by nature a challenging endeavor, especially in an international context, because the level of final impacts depend on many systemic factors—learning and improving services is always an institutional as well as individual endeavor. She thanked the meeting participants for their willingness to share and engage in this important work

3. In the next opening presentation, **Dr Wenjian Zhang** (WMO Assistant Secretary General) offered a high-level overview of the WMO Strategic Plan and its importance to the Membership and the Secretariat in responding to the increasing demands placed on Members due to changing roles and expectation. The Strategic Plan embraces a new comprehensive vision for the Organization, noting that "By 2030, we see a world where all nations, especially the most vulnerable, are more resilient to the socioeconomic consequences of extreme weather, climate, water and other environmental events; and underpin their sustainable development through the best possible services, whether over land, at sea or in the air." Dr Zhang expressed the need of the Organization to global needs by addressing the 5 key long-term goals identified in the plan. These are:

- Goal 1: Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services
- Goal 2: Enhance Earth system observations and predictions: Strengthening the technical foundation for the future
- Goal 3: Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services

- Goal 4: Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens
- Goal 5: Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation

Dr Zhang expressed several general needs to reach the goals, which are spelled out in more detail in the Strategic Objectives. One is to better communicate to our users of the information we provide. Another is to move beyond the traditional weather and climate focus of WMO, and also address the impacts and influences of ocean and land environments, including polar, desert and high mountain regions. To do this, we need to take an Earth Systems-approach, we need consider the additional variables that influence the environment, to consider impacts that include seasonal and sub-seasonal variations and sources of stress. Moreover, he stressed the need for more data from more sources to consider this larger picture in our diagnoses and forecasts. This will require broader partnerships, including additional national, regional and global partners working in a multi-disciplinary manner, not just through agreements, but also through concrete actions. This will also require the joint efforts of science and technology to help us to expand and improve our services to all sectors. Dr Zhang concluded by thanking the meeting participants in their efforts to provide education and training to all regional members and national partners, to contribute to the global agenda through these efforts. 2020 has brought new challenges, but the education and training community has responded with new strengths and capabilities. He reinforced the Secretariat support for the collaboration that forms the basis of the WMO Global Campus.

4. Dr Anna Timofeeva (Chair of the Expert Team on Human Resources Development, Education and Training (ET-HRDET)**,** Director, Institute for Continuous Education (RSHU), spoke about the newly formed WMO Executive Council Capacity Development Panel and its four Expert Teams--ET on Policy Development and Institutional Matters, ET on Human Resources Development, Education and Training, ET on Capacity Development through WMO Technical Departments, ET on Resource Mobilization, Partnerships and Development Assistance. Then she provided a focused discussion of the Terms of Reference of the ET-HRDET, its membership, and the goals of the ET as developed during recent online meetings. She concluded with a set of Expected Outcomes, including recommendations to RTCs on sustainability of education and training under COVID19 pandemic, revised and updated BIP-M and BIP-MT curricula, a roadmap for developing competencies in relevant areas, recommended mechanisms for WMO Regional Training Centres and other WMO Education and Training Partners to ensure and document that their curricula follow WMO standards, and reviewing the Global Campus roadmap for further achievement of its objectives.

5. Dr Yinka Adebayo (Director, WMO Education and Training Office) spoke about current challenges facing WMO education training providers. He used a flow chart to demonstrate the drivers, governance and guidance, support mechanisms, and courses and resources offered to help improve Member services. He then outlined a summary of issues, including limitations in meeting needs, calls for additional support in making a shift to online learning, the need for new programmes and updating existing curricula, preserving the momentum of the WMO Global Campus initiative, and challenges in meeting formal education needs through Fellowships. He also focused on unique challenges to programme coordination due to the pandemic quarantine measures.

6. Ms Josephine Wilson, of the Project Management and Implementation Division, then provided an overview the WMO Projects, their regional distribution, participating Member states, their strategic

alignment with the WMO Strategic Plan, training-specific project activities, and significant achievements made so far through projects.

7. Mr Luis Nunes of the WIGOS Branch of the Observing Networks and Measurements Division, Measurements, Quality and Compliance Unit, within the Infrastructures Department, gave a detailed presentation on the training efforts for the implementation of WIGOS, the focus of WMO Strategic Objective 2.1. He particularly focused on the online components developed before and during the COVID-19 pandemic.

8. Dr Patrick Parrish, of the Education, Training and Fellowships Division, then provided a more detailed summary of the WMO Strategic Plan and its Strategic Objectives as they directly relate to the work of WMO Regional Training Centers and other WMO Education and Training Partners. He shared new reporting requirements on the alignment of programmes and courses to the Strategic Objectives. He shared examples of how the Strategic Objectives, Qualifications, and Competency Frameworks can be better identified in course descriptions and certificates of completion. Dr Parrish also offered a separate presentation on resources available from the WMO ETR Office to guide education and training institutions in the use of distance learning delivery methods during the period of the pandemic.

Day 2 : Participant Presentations and Posters on Responses to COVID-19

The second day of the Event was dedicated to participants sharing the outcomes of Members' experiences using distance learning initiatives and their near-term plans for further implementations. A total of 20 live presentations were made by participants, with 7 additional posters available for consultation. All these resources can be accessed in the Event's page at https://etrp.wmo.int/course/view.php?id=201

The use of e-Learning to give continuation to education and training activities during 2020 was mentioned by all participants as they discussed their experiences. Considerations were made not only to the challenges, but also the positive outcomes that are leading to innovations in in the way they are providing education and training.

Main challenges

Starting from the common challenge experienced by all: to continue delivering training and education when face-to-face classrooms are not possible; some of the most mentioned challenges included, but were not limited to: dealing with technical issues and lack of infrastructure (particularly low quality network connection), conducting assessment at distance, availability of subject matter experts trained to design and deliver distance learning, and providing training on the use of meteorological instruments.

The breadth of innovations implemented to respond to the challenges highlighted the importance of having a well-defined competency framework, the effectiveness of distance learning to reaching broad and diverse audiences, and the value of good partnerships fostering collaborations and support between training providers.

Many organizations reported that they had been using distance learning for many years, and that this made the transition to *fully* online much easier. It meant that online teaching skills of teachers and trainers, as well as online learning skills of their learner audiences already existed, and that the necessary infrastructure was at least partly in place. However, beyond mere experience was the benefit of having partnerships in place, as well as a solid foundation in a variety of training methodologies and principles to guide approaches to online learning that can make it effective. These organizations were already taking advantage of the benefits of scale from online learning--reaching people who would otherwise not be able to participate. It did not resolve all challenges, however. To summarize, one way of addressing challenges is to broaden your experience before they become critical.

Finally, it is important to realise that despite all the challenges mentioned by the participants, there was a general positive attitude towards change. The exchange of information during discussions and presentations also highlighted the impact that the WMO publication on Global Campus Innovations (ETR-No.27) had on the way our education and training partners approached the challenges they faced in 2020. The application of knowledge and methods acquired during the WMO course on Education and Training Innovations (2020) was frequently mentioned by participants, as they explained how they are paving the way ahead to continue responding to challenges and improving the quality of education and training they provide.

Contributed Posters and Reports

Partnerships, approaches, infrastructure and covid: a reflection from EUMETSAT – Mark Higgins, EUMETSAT

WMO-CGMS Virtual Laboratory for education and training in satellite meteorology – Bernie Connell, Luciane Veeck, WMO CGMS-VLAB

Beneficial Collaboration for Distance Learning Training in Hydrological Sciences --Mr. Matthew Kelsch, UCAR The COMET® Program, Mr. Claudio Caponi, World Meteorological Organization, Mr. S N Pande, National Water Academy **(PPT)**

Beneficial Collaboration for Distance Learning Training in Hydrological Sciences --Mr. Matthew Kelsch, UCAR The COMET® Program, Mr. Claudio Caponi, World Meteorological Organization, Mr. S N Pande, National Water Academy **(Full Text)**

Blended online and on campus teaching 2020 in Meteorology at the University of Reading (UK) -- John Methven, Hilary Weller & Andrew Charlton-Perez, Department of Meteorology; Ben Cosh & Karen Poulter, School of Mathematical, Physical and Computational Sciences

International Trainings in CMATC (WMO RTC Beijing) – CIONG Shaoyuan, WANG Zhiqiang, DENG Jingmian, YE Mengshu

WMO Global Campus Report: RTC-Philippines (PAGASA) – Michael Bala

Responding to Challenges Beyond the New Normal: A WMO Global Campus Collaborative Webinar Event, National Water Academy, Pune, India – Ashok Kharya

Challenge Beyond the New Normal, A WMO Global Campus – BMKG, Indonesia

Distance Learning Events from TSMS -- Turkish State Meteorological Service, External Relations Department

Recent Innovative methods initiated in the training activities at RTCs MTI & ICITC, IMD, India – Mr. Somenath Dutta

Responding to Challenges Beyond the New Normal, *WMO Regional Training Centre, New Delhi IMD,INDIA*

Lessons Learnt from RTC Italy – Marina Baldi, Vieri Tarchiani, Elena Rapisardi, CNR-IBE | rtc@ibe.cnr.it

Compendium of our Current Experience at Distance Learning – RTC-IHFR Algeria

Hands-on Activities in e-Learning: Teaching Impact-based Forecast and Warning Services Online – Tsvetomir Ross-Lazarov, Amy Stevermer, UCP/COMET **(PPT)**

Practice Activities in e-Learning: Teaching Impact-based Forecast and Warning Services Tsvetomir Ross-Lazarov, Amy Stevermer The COMET Program / UCP, UCAR **(Full Text)**

Overview of Distance Learning at Lithuanian HMS -- Izolda Marcinonienė

Regional Training Centre, Argentina: Responding to Challenges Beyond the New Normal – Marcela Perez, Marinés Campos

Satellite Meteorology from Home: Limited Bandwidth and Processing Power -- Marcial Garbanzo Salas, Diana Jiménez Robles, Universidad de Costa Rica, Regional Training Centre, VLab Centre of Excellence

Responding to Challenges Beyond the New Normal: A WMO Global Campus Collaborative Webinar – RTC Peru, Universidad Nacional Agraria La Molina, SENAMHI, Teresa Garcia Vilca

WMO Regional Training Center Spain – AEMET, J. Pablo Ortiz de Galisteo

Met Office, Responding to Challenges Beyond the New Normal – John Ward

RTC Nigeria, Responding to Challenges Beyond the New Normal –Abel Olatunji Akinyemi

Interactive Online training In Instrumentation and Measurement of Atmospheric Parameters: Building the Foundation for Field Research -- Rockwell, Alison, W. Cooper, J. Haggerty, H Vomel, C. Wolff; **NCAR Earth Observing Laboratory, Boulder, CO; R. Clark, Millersville University; E. Page, A**. Bol, A. Stevermer, **The COMET P**rogram ; T.Campos, NCAR ACOM

COMET's MetEd Learning Resources: Enhancing Application of New Generation Geostationary and Polar-Orbiting Satellites for the International User Community – Amy Stevermer, The COMET Program

Engaging Learners in Online Instructional Environments – Bryan Guarente, Andrea Smith, Tsvetomir Ross-Lazarov, The COMET Program

Qatar Aeronautical Academy, RTC Qatar – Haya Fadul Alnaimi

Implementing Assessment in Online Instructional Environments -- Tsvetomir Ross-Lazarov, Andrea Smith, Bryan Guarente, The COMET Program/UCP, UCAR

Day 3: Action Plans from Small Groups

While Day 3 consisted of small group discussions on education and training challenges, it actually began with significant preliminary work in advance of the event.

The goal of this final part of the Global Campus Event was to produced action plans to help address some of the most pressing challenges identified by event participants. The results were planned to be used as one source of inputs to the Symposium on Education and Training (SYMET-14) planned for late 2021.

The organizers used the Breakout Group capabilities of Zoom to allow small groups to brainstorm and produce a detailed breakdown of one of the high-level challenges identified and components of potential solutions.

When registering for the event, each institution was asked to submit the three most significant education and training challenges they faced. While 177 individuals participated in the event, they represented more than 30 institutions. Approximately 32 institutions submitted 95 total challenges.

In order to create a limited set of discussion themes, a group of facilitators examined the 95 challenges submitted and looked for similarities and common themes. This produced a table of challenges with proposed themes to which they were connected. (See **Annex 1**) With a goal to have no more than 10 breakout groups for logistical reasons and to heighted creativity and productivity, a final set of 10 themes was produced, but this was further reduced to 9 high-level themes to help focus the event. In recognition of the complexity of these highly distilled set of themes, notes were added representing components that might be considered when discussing the themes. (See **Annex II**). Themes ranged from challenges of delivering online learning, particularly made critical during the COVID-19 pandemic, to more general teaching challenges such as learning assessment and demonstrating the value of training initiatives, to issues related to addressing a broad international audience with a high number of needs and keeping training current in rapidly changing times.

1. Offering technical/hands on training at a distance
2. Overcoming technical and organizational/ practical challenges of online learning
3. Learning assessment
4. Developing general online teaching skills
5. Enhancing communication and interaction in online learning
6. Collaboration in education and training
7. Training evaluation and demonstrating value, including assessing costs of training
8. Addressing needs of diverse populations
9. Addressing new training needs to meet demands of changing professions and international standards

During the event, participants were explained the Breakout Group procedures on Day 1 and asked to select a discussion theme to which they would like to contribute. Because the theme related to "Addressing the needs of diverse populations" received no volunteers, it was removed from the list, leaving 8 final Breakout Groups. This theme remains in Annex II because it is considered an important challenge that deserves future discussion.

The discussions were lively, with between 7 and 10 participants in each group. Action Plan templates were provided to structure discussion. These were designed to encourage deep analysis of the challenges and important details to accompany proposed solutions. Components of the template included:

- Challenge components identified (through elaboration of details and analysis of the group)
- Solutions previously attempted by group members and suggestions for additional solutions
- What group members can contribute to addressing challenges
- How collaboration can contribute to addressing these challenge components
- What innovation implementation challenges will be faced?

Due to the very tight time constraints of about 2 hours, most groups were unable to complete detailed action plans, but many of the plans were further elaborated in the week following the event. The final Action Plans, which contain many insights into the challenges and innovative ideas for solutions, are collected in Annex 3. Some highlights are provided in the table below:

Challenge	Example Solutions Offered
1. Offering technical/hands on training at a distance	• Video yourself or other demonstrating technical tasks in the laboratory or in the field. • Require photo assignments for cloud identification • Students purchase electronic elements to construct their own sensors • Create assignments for group work at different work locations
2. Overcoming technical and organizational/ practical challenges of online learning	• Requires a robust, multidisciplinary team covering different aspects, from IT staff, to content specialists, digital designer, etc. • Research and acquire technical infrastructure • Provide one-to-one coaching for new online trainers
3. Learning assessment	• Synchronous tests using shared screens to monitor learners taking the exams. • Used open book exams with more complex and challenging test items • Use frequent practice with learners before assessments, using different questions and problems • Weaker students benefit from regular testing • Include self-assessment and peer-assessment
4. Developing general online teaching skills	• Necessary roles: Moderators, Facilitators, Chat/Participant Support, Technical Support • There are online webinar software solutions – both free and paid • Tablet computers and styluses benefit teaching math skills • Not everything needs to be 'broadcast' quality. The teaching is much more important • Forget the classical classroom approach in online sessions and think out of the box • Try finding existing resources to re-use instead of doing new ones.
5. Enhancing communication and interaction in online learning	• Explore the benefits and limitations of both intensive week-long workshops vs spaced over a number of weeks (e.g., 6 hours per week over 4 weeks, including on the job training)

	• Gathering and sharing of resources for instructors so that they have a better idea of how to manage the social and communication aspects of the course/training. • Have different types and media of communication channels: general forum, topic forums, social forum (e.g., WhatsApp)
6. Collaboration in education and training	• Collaborations make it possible to face the increasing education and training needs for NMHSs in a changing world • Collaboration implies adhering to open education practices, such as sharing under creative commons license) • Promote sharing of materials created by individual institutions • Have a contact person, but rotating responsibilities. Growing contact base (by roles). • Collaborative development of resources and courses for international applicability • Collaborative workbooks with online simulations • Rotate responsibility for leading collaboration around countries sharing a common language • Hold an international workshop on sharing & developing resources
7. Training evaluation and demonstrating value, including assessing costs of training	• Pre-course survey before content is made available • Competency related questions before and after course • Evaluation during live sessions using polling questions • Issues with training evaluation feedback include: collecting honest feedback, collecting post-training feedback, overcoming cultural differences in providing feedback, measuring performance improvement, getting feedback from managers, estimating costs of training (or focus on outcomes instead)
8. Addressing new training needs to meet demands of changing professions and international standards	• Modularize large courses and curricula for easier updating • Design training with both basic skills and more targeted skills for customization options • Use the assistance of other institutions who have updated curricula • Consult WMO Guides for ideas on how to adapt, especially newly published ones • Stay aware of both new research and new technologies • Use well-organized training plans for building curricula • Academic and operational institutions need to interact

Annex 1: Challenges Submitted by Participants

#	Challenge Faced	Assigned Theme
1	Difficulties in conducting hands on practical session, like taking surface observation, Pilot balloon observation, analysis of synoptic weather chart and T-Phi diagram (Thermodynamic diagram), via online/distance learning mode.	1. Offering technical/hands on training at a distance
2	Difficulties in recording training sessions.	2. Overcoming technical challenges of online learning
3	Difficulties in conducting session end final examination conduction, maintaining all required exam sanctity.	3. Learning assessment (or just Learning Assessment)
4	Network issues during online classes/exams.	2. Overcoming technical challenges of online learning
5	Difficulty in checking & controlling attendance of participants throughout training session.	2. Overcoming technical challenges of online learning 4. Developing general online teaching skills
6	To make digital learning really happen	4. Developing general online teaching skills
7	Knowledgeable staff that can handle online training and the pressure associated with it.	4. Developing general online teaching skills/5. What team roles are required to bring the required development and delivery skills
8	require some training of trainers focused on the new normal tools	4. Developing general online teaching skills
9	Difficulties in some practical activities (instruments, models, computer programing) and assessment (mathematics and schemes)	1. Offering technical/hands on training at a distance
10	low internet debit, especially in rural areas	2. Overcoming technical challenges of online learning
11	Teaching students remotely in a way that is as effective for the students as high-quality in-person delivery.	4. Developing general online teaching skills
12	Assessing courses formally when face-to-face examinations and exercises are not possible.	3. Online student assessment
13	Establishing a social and welcoming environment during remote delivery, for an audience that has never met in-person.	5. Enhancing communication and interaction in online learning

14	Being able to integrate our training – we teach more than the instrument so we need to work with other partners	6. Collaboration in education and training
15	Helping subject matter experts get into trying online training (and not just a series of zoom lectures)	4. Developing general online teaching skills
16	Evidencing the value of training	7. Training evaluation and demonstrating value, including assessing costs of training
17	To reach out to remote trainee participants which requires high speed internet and gadgets at the trainees' side. Our institution is in the process of establishing virtual classroom which may take training directly to the desktop/PC/mobile of the trainees.	2. Overcoming technical challenges of online learning
18	The fusion of distance learning and learning in physical mode in future. Presently, Conferencing apps like Google Meet, Google Classroom and Webex are the popular apps used for conducting interactive classes. Our Institution foresees needs to have an independent platform for conducting training programmes in future.	4. Developing general online teaching skills 2. Overcoming technical challenges of online learning
19	To give hands-on practical classes. In Covid19 Scenario, Practicals like thermodynamic practicals, synoptic practicals, NWP practical sessions, Pilot Balloon and and observational system which requires computer Lab or classroom is seen as a challenge. Our Institution is presently uploading video of above Practical sessions in Google Classroom. This has helped the trainees to get a feeling of doing the practicals. Moreover, trainees are demonstrating the same at Observatories under concerned Regional Met. Centres/ Meteorological Centres of IMD.	1. Offering technical/hands on training at a distance
20	Succession training	13. Addressing new training needs to meet demands of changing professions and international standards
21	Creation of a research laboratory	13. Addressing new training needs to meet demands of changing professions and international standards
22	Renovation of teaching materials	4. Developing general online teaching skills 13. Addressing new training needs to meet demands of changing professions and international standards
23	Pedagogy shift	4. Developing general online teaching skills/Adopting new pedagogical approaches

24	Technological infrastructure (LMS; teaching apps and tools)	2. Overcoming technical challenges of online learning
25	Pluriculturality in a distance learning environment	10. Addressing need of diverse international populations
26	Distributing satellite data to student's homes and the respective processing capacity for product generation.	2. Overcoming technical challenges of online learning
27	Creating a dynamic and efficient environment during online lectures for the undergraduate courses of the Meteorology program.	5. Enhancing communication and interaction in online learning
28	Having an appropriate student-professor interaction to better understand the situation during these times.	5. Enhancing communication and interaction in online learning
29	Adaptar nuevas metodologías de enseñanza para impartir y recibir conocimiento a través de las redes sociales y las plataformas (Adapting new teaching methods to provide and receive knowledge through social networks and platforms)	4. Developing general online teaching skills/Adopting new pedagogical approaches
30	Lograr que los productos y servicios que ofrece la institución lleguen a la mayor cantidad de usuarios en forma clara, precisa y ordenada. (Ensure that the products and services offered by the institution reach the largest number of users in a clear, precise and orderly manner.)	Beyond the focus of the event
31	Mejorar los pronósticos en beneficio de la población (Improving forecasts for the benefit of our customers)	Beyond the focus of the event
32	As this is the COVID-19 pandemic situation, all of the trainings and meetings were held via online. That is why almost all of the participants were faced some difficulties during trainings/ meetings such as internet access broke down, could not catch up speckers' accents well, time limitation for discussions and time different between host and participants' origin and so on.	2. Overcoming technical challenges of online learning
33	Encourage people to take part in training from home pc	5. Enhancing communication and interaction in online learning
34	Engage participants and show activity in distance learning	5. Enhancing communication and interaction in online learning
35	Create new methods and present interesting and useful material to adapt at workplace.	4. Developing general online teaching skills/Adopting new pedagogical approaches
36a	We have challenge in developing online course materials especially for the practical/hands-on sessions.	1. Offering technical/hands on training at a distance
36b	The online assessment and evaluation are other challenges that existed	
37	Since some of RA V Member countries are the SIDS (Small Island Developing Countries), geographical aspect should be considered. This brings challenge in limited access of internet connection as well as different level of supporting learning technology and infrastructures	2. Overcoming technical challenges of online learning

38	A challenge in conducting comprehensive Training Need Analysis for the RA V Member Countries also faced	
40	Difficulties in some practical activities (instruments, models, computer programming) and assessment (mathematics and schemes)	1. Offering technical/hands on training at a distance
42	Redeveloping and blending the Meteorologist forecaster training courses to ensure they are inclusive and meet the needs of a broad range of leaners and the Institution (business) needs, whilst maintaining the overall quality.	10. Addressing need of diverse international populations
43	Continuing to deliver Training under COVID restrictions taking into account the needs of the Learners and Trainers, overcoming a variety of challenges inc. academic, IT and psychological.	4. Developing general online teaching skills
44	Balancing the academic requirements of the BIP-M and the Practical Meteorology requirements of the organisation for the variety of roles (levels). i.e. the balance of front loading the training to meet BIP-M vs 'just in time' training to meet the requirements of the job role.	13. Addressing new training needs to meet demands of changing professions and international standards
45	To get the eumetcal 2 programme rolling even better	
46	Make the step to better ways of online learning than we use now.	4. Developing general online teaching skills
47	Get the competency frameworks implemented for the other groups than forecasting within KNMI	13. Addressing new training needs to meet demands of changing professions and international standards
48	We have challenges in developing and delivering distance learning/online course materials.	4. Developing general online teaching skills
49	We have limited access to internet connection, we are also facing challenges in the area of technology and infrastructure.	2. Overcoming technical challenges of online learning
50	We need capacity development for trainers on online training methodologies and technologies	4. Developing general online teaching skills
51	Recruiting excellent people into atmospheric science from schools, those who already have mainstream degrees (such as maths and physics) and those coming from other career areas. Awareness of the career opportunities associated with meteorology and related weather services is low.	
52	Coping with the diversity of background knowledge and experience of trainees (delivering excellent training for students with a range of training needs).	10. Addressing need of diverse populations
53	Widening access to education and training leading to higher qualifications and meeting career aspirations.	13. Addressing new training needs to meet demands of changing professions and international standards

54	Balancing training needs and operational imperatives - In any organisation where staffing resources are constrained, it is easy for training days to be sacrificed to fill holes in an operational roster. Continued dialog with operational management is required to ensure a shared understanding of the training and assessment overhead to have a competent and current workforce and the risks introduced if these activities do not occur.	7. Training evaluation and demonstrating value, including assessing costs of training
55	Understanding the costs of training and assessment - There is an expectation that where possible training and assessment can be delivered flexibly and on demand, at the same time training centres are asked to stand up training quickly. On demand/online training has a significant up-front cost, a one-hour activity may take a couple of days to build if you have the curriculum and materials. Training that was once a day of face to face training may take a couple of months to build as an online option. This requires us to train our stakeholders to engage with us early on identified training needs.	7. Training evaluation and demonstrating value, including assessing costs of training
56	Upskilling trainers in new techniques and technologies - COVID has accelerated a shift into new digital technologies with trainers needing to quickly become proficient in tools like Teams and BigBlueButton. In addition, more powerful LMS plugins are coming along, like H5P and Generico filters and there is an increased need for engaging video production. Upskilling our trainers in these key learning design skills is a professional development challenge.	4. Developing general online teaching skills/ Technical skills for distance learning
57	Demand for continuous training is growing in Meteo-France Maintain and enhance the efficiency of training. Huge efforts have been achieved since the beginning of COVID 19 crisis. The goal of my department is to reuse the results of these efforts to add value to training in the future.	4. Developing general online teaching skills/ Building on successful examples
	The impossibility of interacting in person with other meteorological professionals and sharing knowledge spontaneously, because this is the way in which some of us can learn naturally.	5. Enhancing communication and interaction in online learning
58	New Technical Advanced Human Resource	13. Addressing new training needs to meet demands of changing professions and international standards
59	Pandemic alone was a big challenge during this period, because we are trying to transform the training activities we have conducted face-to-face many times before, into distance learning. However, our views on this subject are that experience is the key to every process. Besides its difficulties, the pandemic process is instructive.	4. Developing general online teaching skills/Conversion from existing classroom courses

60	Time difference in distance learning are quite difficult in terms of synchronized lessons. That's why we plan to do less synchronized lessons. Instead of these synchronized courses, we plan to reach participants through forums.	2. Overcoming technical challenges of online learning General
61	There are many ways to increase efficiency in distance education but choosing the most suitable one for the team. It is quite challenging to get to know the whole team that will teach in every different subject and to determine the correct methods.	4. Developing general online teaching skills/Pedagogical aspects
62	Technologies. In current and foreseeable future, the technology-enhanced learning would become a new trend, bringing new challenges to training organizing, course design, platform development etc. The online trainings held by different training institutes in different countries vary in types, criteria, platforms and so on. A integrated online training framework would be recommended to establish by WMO to promote international communication of education and training as well as improve the normalization of trainings.	2. Overcoming technical challenges of online learning 6. Collaboration in education and training
63	Access to training materials. High-quality meteorological training materials, such as COMET online resources, CMA's training materials on FY satellite meteorology, nowcasting, and aeromet, are in urgent needs. Hopefully, a regular selection mechanism could be adopted and carried out by WMO to promote the production and sharing of online training materials globally, benefiting countries around the world, especially developing and underdeveloped ones.	6. Collaboration in education and training
64	Trainings for trainers and instructors. Aimed to provide global seamless system observation and prediction services, online training brings higher requirements to trainers and instructors compared to on-site. It is recommended that WMO could offer more opportunities on training, communication, and inspiration for trainers and instructors and promote shareness of trainer resources.	4. Developing general online teaching skills 6. Collaboration in education and training
65	Gradual reopening after abrupt closure	2. Overcoming technical and organization/practical challenges of online learning
66	Rethinking student flows (smaller classes, changed modality)	2. Overcoming technical and organization/practical challenges of online learning
67	Accommodating international students in post-COVID world	10. Addressing need of diverse populations 4. Developing general online teaching skills / New models

68	La sobrecarga de trabajo (Increased workload)	4. Developing general online teaching skills/emphasis on efficiency
69	Material educativo (Access to educational materials)	6. Collaboration in education and training
70	To design new forms of evaluation	3. Online student assessment
71	Learning development opportunities	4. Developing general online teaching skills
72	Digital skills	4. Developing general online teaching skills/ Technical aspects (perhaps)
73	Seeing is believing: Lack of project/ field visit experience	1. Offering technical/hands on training at a distance
74	Difficulties in conducting hands on practical session, particularly for design of various components of Water Resources Projects, and other modelling tools which require commercial / proprietary software	1. Offering technical/hands on training at a distance
75	Capacity development for trainers on standardized online training methodologies, tools and technologies needed	4. Developing general online teaching skills
76	Network problems especially in the rural and riverine/coastal communities to run online/distance learning conveniently.	2. Overcoming technical challenges of online learning
77	Cost of: (1) developing and delivering distance learning/online course materials (2) purchasing internet bundles by the students that will be enough to run the programmes and	7. Training evaluation and demonstrating value, including assessing costs of training
77b	the distractions at home while running online programmes.	5. Enhancing communication and interaction in online learning
78	Lack of physical intellectual interactions between students and Instructors/Lecturers and students and students especially during practical and after lectures.	5. Enhancing communication and interaction in online learning
79	Adequate administrative and technical assistance to deliver additional virtual courses.	7. Training evaluation and demonstrating value, including assessing costs of training
80	Adequate funding and personnel to continue with existing virtual training.	7. Training evaluation and demonstrating value, including assessing costs of training
81	Continuing Professional Development focus for both the trainers and trainees - essentially addressing different levels of expertise and continuity for both groups (which includes addressing aspects of retirement and moving on to different positions).	13. Addressing new training needs to meet demands of changing professions and international standards
82	Improve instructional design and trainers competencies: trainers should face the challenge of this “new way” of teaching and adapt both resources and learning outcomes for the benefit of the participants; start by searching available resources;	4. Developing general online teaching skills/including blended learning, adapting existing courses

	adapt face-to-face courses to virtual mode; develop and implement a blended learning approach.	
83	It should be noted that the Universities have institutional restrictions regarding online learning, at present. So the greatest challenge for universities is that the skills in the implementation of new technologies in training will be strengthened to develop blended courses.	7. Training evaluation and demonstrating value, including assessing costs of training
84	There is a need for more experts to become good trainers and dedicate some of their time to developing and delivering the necessary courses. one way to go about this is to insist on collaboration among experts from different countries and institutions to develop priority courses together. Spot young leaders.	6. Collaboration in education and training
85	Implement an interdisciplinary and integrated approach in training	13. Addressing new training needs to meet demands of changing professions and international standards
86	Adapt international training packages, resources and examples, and apply them regionally and locally. This will help our innovation implementation plans move on (such as probabilistic forecast and uncertainty, impact-based forecast, disaster risk reduction, GAWTEC training in Spanish).	6. Collaboration in education and training
87	The greatest challenge for NMHS is to reach out to all operational personnel in RIII. (Even if we offer in online training courses to numerous participants-- up to 100)	13. Addressing new training needs to meet demands of changing professions and international standards
88	Develop and implement a collaborative training action plan in the Iberoamerican region that responds to the strategic plan of that regional association.	6. Collaboration in education and training
89	The challenge is to learn how to interact effectively together: NMHSs and Universities in the context of Global Campus (existing resources). There needs to be an effective communication procedure between the different actors in the Regional Association and RTCs- so that we can act in harmony, develop and maintain a continuous priority needs assessment plan and provide training response in a collaborative manner. - One suggestion is to carry out an ABC Learning style for a fast-track Curriculum Plan and produce a Calendar of Training events for 2021.	6. Collaboration in education and training
90	It is within this collaborative environment that many issues can be solved: such as the importance of RTCs Interaction with Projects that are funded , providing training service associated to the corresponding project	6. Collaboration in education and training
91	Who translates what: to avoid superposition of efforts. For many years by now, experts from RTC Argentina and others have contributed in revising translations carried out by COMET. In the same way,	6. Collaboration in education and training

	we could plan the translation of key training activities, resources or information (which are not being undertaken by WMO)	
92	Develop and carry out innovation implementation plans. To be able to respond to societal needs, the services and training institutions must introduce change in their organizations and regions following a design thinking scheme. Every step is to be considered for a successful result. This concept must be introduced wisely at all levels within the organization. Young university graduates, personnel at SMN have proved to be motivated and engaged (hard working) and well prepared and to promote change, so shouldn't they be empowered within a supportive structure?	This recommendation was incorporated into the Action Plan Template
93	Ensuring continuity in training activities and of the courses development team, which requires financial and human resources, particularly when training is not the main institutional mission.	7. Training evaluation and demonstrating value, including assessing costs of training
94	Training needs (before) and learning (after) assessment.	15. Training Needs Assessment, particularly in international context 3. Online student assessment
95	3) Improving networking with RTCs and with other institutions (Eumetsat, Calmet, Copernicus, Comet,...).	6. Collaboration in education and training

Annex II: Breakout Group Themes

(Developed from submitted education and training challenges)

Themes	Some example components that might be considered
1. Offering technical/hands-on training at a distance	- Requires creative solutions to learning at a distance - E.g., Simulation, experience with local tools - Different needs based on job roles, and evolving job roles
2. Overcoming technical and organizational/practical challenges of online learning	- Partially an infrastructure problem - Considering the use of both asynchronous and synchronous modes - Taking advantage of the benefits of face-to-face time - Also includes impacts to organizational structure and skill requirements, as well as learning schedules and process, such as the transition back to more traditional modes - Strategically utilizing both face to face and online modes for their unique values - Overcoming perceptions that online learning is of lower quality by default
3. Learning assessment	- Includes challenges of online learning assessment - Also includes reconsidering all forms of assessment to make them more authentic and well-aligned with expected outcomes - Formative and Summative assessment
4. Developing general online teaching skills	Many skills and challenges were mentioned by participants: - Diverse and new teaching team roles - New resource development skills - Identifying technologies required - Technical skills for using new tools - Access to successful examples to consider as models - Conversion from existing classroom courses - Pedagogical needs and options, for both online and classroom - Time requirements and developing efficiencies, communicating time requirements - Differences in synchronous and asynchronous online learning - Development and sharing of model courses
5. Enhancing communication and interaction in online learning	- Includes facilitation and virtual learning environment management - Strategies for ensuring ongoing communications with and between students - Consider diverse needs and preferences for communications - Orienting students to online learning environment and unique characteristics
6. Collaboration in education and training	- Sharing resources - Collaborating on projects - Sharing challenges and solutions - Sharing model courses and templates

7. Training evaluation and demonstrating value, including assessing costs of training	- Training evaluation for continuous improvement - Methods for evaluating impacts of training - Training evaluation for demonstration of value to stakeholders - Knowing true costs and cost benefits of training, as well as benefits of improving service delivery, are critical to demonstrate value
8. Addressing new training needs to meet demands of changing professions and international standards	- Included needs assessment elements - Includes elements of managing the implementation of innovations
Did not discuss: Addressing needs of diverse populations	- Includes Needs Assessment elements - Includes interdisciplinary elements - Includes diversity of skill levels and tools and infrastructures - Includes geographical diversity - Gender - Cultural differences - Future professionals

Annex III: Action Plans from the Breakout Groups

(Beginning on the following page)

Responding to Challenges Beyond the New Normal

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Action Proposal Template

Challenge Name: Offering technical/hands on training at a distance (Group 1)

Breakout group participants: Winifred JORDAAN, Ahmed Adedoyin BALOGUN, Ahmed BOUZID, Mohammed TABET AOUL, Eduard Podgaiskii, Temidayo Israel POPOOLA, Matt Kelsch, Brendan Kilshaw, Heba Taha, Meihua WANG, Maman SUDARISMAN, Mustafa ADIGUZEL

Components identified (through elaboration of details and analysis of the group)	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
Practice in surface observations.	Video yourself doing things where possible.	Action cameras or live streams using cellphone apps, but these are demanding to bandwidth	A pool of how-to videos from various weather stations, such recordings are in great demand	
How do you teach students to make observations?	Video people doing it in the field. COMET have done this with video and photos. RSHU had photo assignments (cloud atlas)			**COMET found internet connection issues in the field. Synchronicity was a problem. Scale can be a problem in video/photo.**
Hands-on experience.	Reading Uni. Students purchase electronic elements to construct their own sensors	Assembling instructions, 3D models for shelters and racks, software libraries, Python-based notebooks and guides	Sharing resources on what can be done with such data (comparison, various platforms, accuracy, instrument lag, etc)	**SAWS state that money is a problem for students and institution (RSHU can only offer this as an optional activity, given the costs involved for students)**
	Provide data for analysis (even working with old observation logs!)	Share good case studies, visualizations and guides to analysis		

How can participants put what they learn into practice	Live presentations from students – ability to present online is an extra competence needed in the new normal		Provide international student audience for intercultural communication and language skills	
	Students bring their own local case study to the distance course. Students practice. Trainers provide guidance. The case is then presented and reviewed.	RTC Beijing found small groups worked better.	RTC Beijing have opened up their courses – can other institutions do the same? By grouping external students around their own tutors extra workload for hosts can be decreased	**Students need access to the relevant software to conduct the analysis – which may limit them if they work from home.**
Some modelling tools required proprietary software.	RSHU have tried desktop remote access software (e.g., TeamViewer).			**Challenge to have a teacher supervise modelling activities of several students at a time (solution?)**
How do you deal with connectivity issues?	RSHU offers a downloadable version of assignments to be completed at home. Zipping larger files, some messengers proved to be more reliable for sending files than e-mail		Group 2 may have addressed that	
Numeric models training online – the finer models provide a great challenge to forecasters. How to practice model interpretation?	Group work (grouped by location) – discussion among many levels of experience (RTC Beijing).			

Responding to Challenges Beyond the New Normal

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Action Proposal Template

Challenge Name: Technical Challenges of Distance Learning (Group 2)

Participants to the discussion: Marina Baldi, Elena Rapisardi, May Sabai Oo, Peter Odjugo, David Farrell, Paul Kucera, Nathaniel Servando, Abel Olatunji Akinemi

Components identified (through elaboration of details and analysis of the group)	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
Internet infrastructure	This is a twofold challenge, and affects Training Institutions offering the DL, but also trainees with limited internet connection. Explore alternative modes and formats using TV and Radio. Design and Planning Robust multidisciplinary team covering different aspects from IT staff, to		Strong collaboration with the Training Institution/NMHS/University can help to face and solve the first part?	

	content specialists, digital designer, etc			
Limited Resources Developing online resources is time-consuming and expensive.	Online requires financial resources as f2f (costs shift). Re-adapt and use of existing material can be a (partial) solution, but also other sources of funding and/or sponsors need to be investigated.		Collaboration with the Institution (other RTCs and NMHS, Comet, Eumetcal) which produced the material to be used, in order to readapt it properly.	
Hands-on sessions (asych-sync)	Design and Planning / "troubleshooting coaching" (sync: 1to1 interaction, set up a personalized calls calendar | sync&async: email, e.g. GitHub forum) Recording practical sessions for later access (e.g. as unlisted youtube video) Use of instructional video (e.g. on operating principles of instruments) already		RTCs and NMHS best practices sharing. Strong partnership between the Training Institution and NMHS in order to benefit from local expertise to support trainers during DL.	

	available from other Institutions.			
Elearning Team	Multidisciplinary team, Train the trainers		Collaboration with WMO and other Training Institutions facilitate to offer more “train the trainers” opportunities. Visit Trainers Resources Portal and CALMET Commons for shared resources.	
Diversity (geo/cultural/skills)	Design and Planning: during the design and planning phase take into account all the aspects related to diversity issues of the targeted users. Possibility to limit participation from only a defined (geographical) area.		Coordination with WMO for planning international activities potentially interesting for more RAs	

Responding to Challenges Beyond the New Normal

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Action Proposal Template

Challenge Name: Learning Assessment (Group 3)

Participants: Luciane Veeck, Tsvetomir Ross-Lazarov, Kathy-Ann Caesar, Marcela Perez

Components identified (through elaboration of details and analysis of the group)	• **Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
Testing learners based at home	• Synchronous tests using shared screens to monitor the learners taking the exams. Learners were not allowed to consult learning materials or notes – Learners performed similarly to usual face-to-face exams	• Group members will share some resources in the Forum; • The Group will organize Webinars on the topic of assessment.	• We will keep having this discussions, so we decided to meet every six months to discuss challenges and solutions related to assessment; • Keep in touch via Forum to start with.	Moving learners and trainers beyond the idea that assessment is about measuring the recall of information.
	• Used open book exams, where learners could consult notes, learning materials, internet. The challenge was to ask questions that			

	were new and challenging; • Practicing before with learners, using different questions, helps • Weaker students benefit from regular test			
Weaker and anxious students underperform in assessments	• Weaker students benefit from regular testing; • If implementing frequent low-stakes testing, familiarize students with these psychological research findings: • Testing effect – long-term recall of content is higher for material learners have been tested on • Desirable Difficulties: the more effort learners expend in solving problems and recalling information, the more likely they are to remember it • Illusion of mastery – learners are terrible			

	judges of how well they have learned something. Testing helps them see what they need to work on. • Can be used as summative and formative assessment • Using "summary sheets" – Ask learners to write down a brief summary of past week, or take an exercise that revises one main aspect of the past week			
Assessing knowledge versus skills/competence	• Using stealth assessment • Gradual buid-up of difficulty in skills that need to be used; • Self-assessment and peer assessment as a way to help learners to reflect on their own learning (identifying strengths and weaknesses)			
Getting to know our learners when we do not meet them face-to-face	• Giving feedback on assignments that "feedforward"			

	• Have learners to work in small groups, allowing the trainer to observe discussions • Use “free recall” activities at the end of lectures (write for 10 min a summary of what you recall). Then ask learners to compare the summary with the notes taken, so they can identify areas they need to concentrate review			

Interested Partners to continue exploration of the challenge: All members in the Group!

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Responding to Challenges Beyond the New Normal

WMO Global Campus Collaborative Webinar

Action Proposal

Challenge Name: Online Teaching Skills (Group 4)

Participants: Andrew Charlton-Perez, Bryan Guarente, Barbara Bourdelles, Larissa Timofeeva, Roro Yuliana Purwanti, Teresa Garcia, Ji Wenbin

Components identified (through elaboration of details and analysis of the group)	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
1. Diverse and new teaching team roles	Training is vital for most people. Our student demonstrators are well versed in the technical aspects of online communication but still struggle with the pedagogy of teaching with no body language and no pencil and paper interaction. Takes practice. Some colleagues who were earlier working on travel administration in our unit, have learned new skills in being hosts	Use various ways to organize collaborative activities: projects, Google sheets for online work, learning in groups	More collaborative work Peer supports and sharing useful tools and links.	Changing roles is more difficult than changing teaching mode To stimulate the student in self-learning Help students changing the way they were used to work, giving them a more active role in their training.

	and organizers for online events. Roles for people to fill: Moderators, Facilitators, Chat/Participant Support, Technical Support			
2. New resource development skills	Improve communication skills to be very efficient Collaboration mechanisms Using podcasts instead of videos, there are smaller to download. Some interactive sessions are to be used in teaching resources development to increase learning attraction.	Don't be afraid that your video isn't perfect. You can't re-record everything. Remember it's almost always better than the lecture you gave when tired and distracted.	Sharing resources would help not to re-invent the wheel. Definitely!	
3. Identifying technologies required	Various online webinar software solutions – free and paid solutions (list would be long) Tablet computers and styluses are such a benefit for teaching anything with lots of maths. They work well with all video conferencing tools Use less different online platforms (for consistency). Make		We appointed an 'online coordinator' role at Reading and that really helped to short-circuit some technical challenges. One person knows all the tricks to use and can share that with others. A collaborative directory of free software could help many organizations	Always dependent on commercial solutions which have pros and cons (Teams vs Zoom for example)

	collaborative choice, use best practices Have been surprised at how good modern laptops are at recording video (internal cameras/mics). Sometimes we think everything needs to be 'broadcast' quality but actually the teaching is much more important Have the necessary accessories to be able to communicate with the learners easily, such as high-performance camera, microphone … To have free software catalogs updated at least every half year.			
4. Technical skills for using new tools	Needs some training, but there are many tutorials --> gaining new knowledge is simplified Training of our teachers for them to use new software and tools, like videoconferencing tool, Wooclap, stylus, and virtual whiteboard. Briefing and trial session for trainer(s), a pre-	Some RTCs have skillful trainers, facilitators and TSO can help other RTCs	Useful to see how others are using breakout rooms. We found the new Teams solution far from optimal and that the old 'workaround' is much better (channels and a Team per course, students can retain their discussion etc.)	Internal regulations

	course for technology familiarization for trainees, provide facilitator(s) and technical support officer (TSO) that accompany trainer(s) and trainee(s) Learning data analysis can help learners' performance We are doing a voluntary coaching-course for our employees to help them work with our LMS (to find tasks they need to solve etc.), so they should later be able to solve all the online learning modules without problems		Sharing trainers, facilitators among RTCs	
5. Access to successful examples to consider as models	I had already converted my course to a flipped learning mode (work 4 years ago) this meant the transition was very easy and I didn't have to spend the time like my colleagues in reimagining my course. Models like this can help to be flexible for a mix of in-person and blended learning (see my article in		Need to have a shared directory of resources, maybe Global Campus Library. Reading WMO Innovations publication to grab ideas and contacts' names Some great talks about computer and physical lab work online this week. Really keen to explore this in general and happy to see ideas. Field work also so	

	the Innovations WMO volume) Online (cloud) computing rather than using students own laptop (comes with issues of equity). Equal opportunities.		vital – what can we get students to do in their own backyard?	
6. Conversion from existing classroom courses	Don't record long videos that people don't watch – short is king for retaining attention Make students more active, and work by themselves out of classroom time Digital content creation Active breaks and longer breaks during lessons are helpful & needed == icebreaking for 'charge emotional, physical, spiritual, mentally) Recorded shorten lectures and shared them to students to review Active breaks Shorten content ask several questions to allow a better interaction between the trainer and the participants	Comet lessons, USGS media gallery: We can work with others to help them think about how we did it (not perfect but generally well received)	Share resources	Useful to rethink existing structures. Is it important for students to go away and think about something for a week or better that they have intense periods working on one course? Update content Converting resources and courses takes time and innovation could be delayed due to other duties priorities

7. Pedagogical needs and options, for both online and classroom	We have tried to re-programme our minds to forget the classical classroom approach in online sessions and think out of the box Re-organizing teaching with consistency in mind. More interaction Flipped classroom is a useful model --> students work on content themselves, a discussion in plenum / a classroom-session follows Have students write blogs Using social networks to comment an "image of the day" to share observing skills. More than ever student engagement is critical. So easy to become distracted and worn down in current circumstances. Both recorded content and interactives have to be fun and they have to have real-world meaning --> It would seem that adding more active interactive elements (i.e., analysis		Sharing ideas how others have solved classroom to online challenge. Testing solutions in safe environment with collaborators helps. Happy to share some of our data from e.g. micro-met experiments along with code to do some analysis Organizing training on online training skills. Talk together to brainstorming on solutions, like a just-in-time training during emergency time like pandemic.	Needs courage and dedication to try a new approach. Formulate and prepare a new pedagogy for on line learning

	tools) or problem-solving (i.e., writing their own communication of a forecast) to a course is one of the best ways to increase engagement (BG) What do others feel about insisting students turn on their camera. I have found this a great way to encourage more engagement but I'm nervous because of privacy issues for some students. Not everyone wants to or can show the inside of their house Thinking to the way we used to teach and live before the pandemic and considering that it was not so wonderful neither, but we were used to it.			
8. Time requirements and developing efficiencies, communicating time requirements	Try finding existing resources to re-use instead of doing new ones. In the syllabus, students should be given a timeline and some information about how long each piece of work			

	will take. It is hard for a student to know how important certain content is in the grand scheme of things since they don't necessarily know the grander scheme. I think important also to encourage students to work on a timetable and stop each day and do something else. Hard when students are in remote time zones. I really feel for the students who are living much of their lives through a screen (and important to remember the need for the social part too)			
9. Differences in synchronous and asynchronous online learning	In asynchronous situation teaching activities, learners can arrange their learning time independently, but they need well self-regulated. In synchronous teaching activities, students can follow the progress of teachers. During the synchronous course, record the			Time zones are always difficult for interactive training – but engagement is so much better for interactive (synchronous) There may be a large number of online learners. How to effectively plan the number of participants in learning courses to

	session and prepare the documents course and make it available to those who cannot attend Asynchronous teaching activities could be interspersed with synchronous teaching, adopt interactive designed activities, and make learning plans and schedules for learners.			synchronous courses and asynchronous courses. Some learners can watch videos and documents, but the network conditions may not be good, and they may not be able to keep up with the synchronous teaching time
10. Development and sharing of model courses	Would be helpful to share developed courses with other countries / other weather services, this enables to further develop these courses and, in the end, brings a higher quality of online courses		Presenting the documents and videos of model courses on an open online platform/website/link Creation of a centralized resource pool or database where developed models/resources can be easily accessible and shared	bad bandwidth can limit the access to the internet

Interested Partners to continue exploration of the challenge:

Andrew Charlton-Perez (University of Reading), Bryan Guarente (The COMET Program; guarente@ucar.edu), Barbara Bourdelles (ENM-Météo-France)

Larissa (RSHU, Saint Petersburg), Roro Yuliana Purwanti (BMKG, Indonesia), Teresa Garcia (SENAMHI, Peru), JI WENBIN (CMATC)

Responding to Challenges Beyond the New Normal

WMO Global Campus Collaborative Webinar

Action Proposal Template

Challenge Name: 'Enhancing communication and interaction in online learning' (Group 5)

Participants : Bernie Connell, Mark Higgins, Moira Doyle, Murat Altinyollar

Components identified (through elaboration of details and analysis of the group)	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
Non-meteorologists: Engagement Initially, interest declines after a period.		Online solutions: Have different types and media of communication channels: general forum, topic forums, social forum (eg. On whatsapp) Note – this is applicable across all components identified.		
University Students: initial shyness, later they become more interactive although they are very sensitive to peer acceptance. (These both become more challenging in the online environment.)				

Continuing Professional Development: mainly mid-level technicians and engineers, sometimes entry level. For distance learning: Time difference challenges for delivering. It is also challenging to get the full attention of the student; they are distracted by job tasks. Hard to define boundaries in distance learning.	For distance: suggest obtaining 'permission/release' from tasks. Formal vs informal learning; many students do not feel like they are learning in informal type settings. Good to highlight and explore the benefits and limitations of both intensive week-long workshop vs spaced over a number of weeks (eg. 6 hours per week over 4 weeks on the job training) vs. RFG sessions.	Explore these topics from the perspective of the instructor recognizing the benefits of the various types of learning and the students recognizing that they are in fact learning or forgetting from various types of instruction. References: Make it Stick - non-technical reference to pedagogical aspects https://www.goodreads.com/book/show/18770267-make-it-stick Social – what promotes effective online learning https://teachingcommons.yorku.ca/wp-content/uploads/2017/11/Cutting-the-distance-in-distance-education.pdf Note, this is applicable across all components identified.	Gathering and sharing of resources for instructors so that they have a better idea of how to manage the social and communication aspects of the course/training.	Finding acceptance among competing challenges in the organization.

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Responding to Challenges Beyond the New Normal

WMO Global Campus Collaborative Webinar

Action Proposal Template

Challenge Name: Collaboration in Education & Training (Group 6)

Participants: Marinés CAMPOS, John Methven, Amy Stevermer, Izolda Marcinoniene, Michael Bala, Zhichao Wang, Valentina Gorbatenko

Components identified (through elaboration of details and analysis of the group)	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
Impact-based forecasting and local relevance to NMHCs	Creation and sharing of materials.	Amy, Marines, Michael, John, Izolda	Other regions developing COMET materials further. E.g., impacts tables. Sharing via WMO Moodle?	Top priority
Networking function of regional collaborations	Contact person. Rotating responsibilities. Growing contact base (by roles).	Izolda, Marines, Michael	Widening pool of expertise. Wider international support.	
Resource for tropical meteorology and forecasters	Using NWP models and interpretation into forecasts	Michael, John, Wanzhi	International workshop on sharing & developing resources.	
Development of conceptual models for forecaster training in different regions	Workbooks with online simulations etc applying conceptual models. Simulated forecast desk.	Marines, Amy, John	Need link with universities/research to develop the models. Local forecaster knowledge.	
Collaboration on translation of training material into different languages	Rotate responsibility around countries sharing language?	Amy, Valentina, Marines	Identifying which partners want to share translation workload.	

Model courses on the WMO Moodle – e.g., marine sciences. Reducing duplication of effort	Marine sciences as an example – as a good start.		Collaborate in efforts to develop new modules along these lines. Likely requires funding resource.	Global roadmap on what to develop and how to ensure alignment with WMO strategic plan. How to keep it up to date?
Nature of relationship between operational centres and universities (in practice vs academic). Input of new research into operations.				
Aligning to WMO strategic plan (need to collaborate on this)				
User stats on training material accesses	Being tracked		Already exists for COMET via MetEd registration system.	

Additional Notes by Participants:

The identified challenge for discussion in group 6 is Collaborations among training providers- which has proved to be advantageous in many ways. If we take into account the intended outcomes of this GC event and we could agree on the following aspects:

- The role of Training in fullfilling WMO Strategic Plan, can only be met through collaboration.
- The collaborations generated by the training providers, should respond to Capacity Development priorities communicated by WMO Secretariat Technical Departments, and thus contribute to meeting these priorities.
- It would be important to recognize the value of Training across every sector of a NMHS, supporting the goals of the Strategic Plan of the institutions, and as part of every project and innovation;
- Collaborations make it possible to face the increasing education and training needs for NMHSs in a changing world;
- Collaboration implies adhereing to open education (sharing under creative commons license)

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Since there are different types of education and training providers for different audiences, **collaborations also take different forms.** There is already a wide array of examples of successful training collaborations which are already part of Global Campus resources or presented in " Innovations in Training" publication , some of them were discussed in our group. Still much more should be done to actually reduce the gap of training needs and achieve training goals that show a positive impact in the community. Our group discussed their greatest challenges for which they would like to have assistance or advice

There could be an Action Plan for different collaborations:

Who collaborates?

- Collaborations among trainers and expertd from Local institutions- (NMHS, Universities, Civil Defence, related Ministries (such as Agriculture), Ocean /Water Authorities, space Agencies, Aeronautical Agencies- Private)
- Collaborating through Mentors
- Regional collaborations , among members of WMO Regional Association (RTCs, Regional Cllimate Center, Regional Wigos Center, etc)
- International collaborations
- Projects , Centers such as GAWTEC, Vlab, CEOS,
- Task teams

Which are the different goals for collaborating?

- Courses and resources responding to training needs of operational personnel (competency based training),
- Continuous training and updating (including Train the Trainers)
- Training due to innovations
- Research collaborations
- From research to operations
- Interdisciplinary : Impact based / DRR

What do the collaborations consist of ?

- Developing curriculum
- Developing a Blended Learning Storyboard: face to face classroom, online learning, informal/ on the job/ in the field with the correponding training strategies and tactics
- Production of resources such as: examples, simulations, case studies, workbooks, quick guides, different type of activities

- Courses (short/ long/ certification) (face to face/ online/ blended)
- Model courses to be adapted
- Webinars
- Self directed training resources/ courses
- MOOCs
- Conferences-Meetings and Action Plans
- Discussion Groups
- Community of Practice

It would be useful to summarize collaboration initiatives in a **Global Training Roadmap** alligned to WMO Strategic Plan as a guide for global and regional collaboration among universities, RTCs and other training providers . This Global Training Roadmap would be useful for defining the **Regional Strategic Training Plan** for each Regional Association. Need to learn how to apply this Roadmap in their own region and subregions and countries (most pressing, current challenges).

Collaboration means active participation from all stakeholders (in meetings, responding to surveys, submitting reports)

CHALLENGES FOR EFFECTIVE COLLABORATIONS

⇒ Effective communication between the different actors
⇒ Learn how to integrate colleagues from different countries, assign roles and tasks, develop and follow a collaborative Training Development Plan (Project management skills). Keep engagement.
⇒ Active use of GC webpage: submit collaborations to GC Calendar 2021- share in Collaborative courses and Events, library or training resource portal

Responding to Challenges Beyond the New Normal

WMO Global Campus Collaborative Webinar

Action Proposal Template

Challenge Name: Training evaluation and demonstrating value, including assessing costs of training (Group 7)

Moderators: Elizabeth Page, Heleen ter Pelkwijk

Components identified (through elaboration of details and analysis of the group)	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
Feedback from learners – collecting honest feedback and follow-up feedback	Using train the trainers to learn about pre and post testing and demonstrate with that training. Use LMS to facilitate. Pre-course survey is used before Moodle section is made visible. Competency related questions before and after course (for short courses). Evaluation during live sessions using poling questions – bank of questions that you can use to maintain engagement to give feedback during the lesson.	Using local networks for instance EUMETCAL to share results of trial. CALMET Global Campus Communication	Partnering with the offices where the learners work Providing written communication on individual students to the offices where they are deployed (hand over report) Having an on the job training coordinator Assessments and evaluation of students (checklist and identify any gaps) and this is sent back to the training center.	Some solutions – Microsoft forms in 365 suite for quick and easy quizzes. Does not need to be done in the LMS. LMS – using Moodle, other systems have functionality for quizzes and evaluations and automatically send follow up evaluations. Short questionnaires are helpful to obtain quick, simple feedback

Making sure the feedback is authentic. Cultural differences in comfort with providing feedback.	Solution is to provide additional support and more direct interaction with the students.		Some directors will send feedback	
Performance/Behavior Improvement	Measuring against objectives Pre and post tests During course polling Extra support		Written communication regarding individual students	
Feedback from managers	Questionnaires Competency assessments On the job training			Moodle
Cost – estimating staff time – staff costs, costs of having staff offline (and the people who take their place) Cost to Stakeholders upfront cost can seem very high	Template to communicate with cost estimates Focus on outcomes Gear solution to the needs of the content and stakeholders	One on one with the service owner – feedback and effectiveness	Collecting evidence along the way and sharing best practices for other topics to demonstrate cost effectiveness	HR systems can capture training days. There is also a small time investment related to that.

Supporting thoughts and notes:

Competency assessment – aviation is rigorous using local managers (and need to set standards and train managers through courses to ensure consistent assessment

Certificate for training assessment for industry based learning (expensive to maintain and takes 6 months to complete)

Competency assessment for Aviation – review of two year program, sit for exams and competency metrics are higher for officers. If they fail the test, they leave the program. Every branch has own assessment to deliver service to every aspect. They can move to other branches of service. Expected to have annual evaluation report – based on ratings their elevation to other roles is determined.

Defining change in performance is it due to training or other factors. After 6 months, the opinion of the training may change. Example with aviation – possible solution - After 3 months evaluation of performance after the training and if it has changed, and manager answers a questionnaire, other stakeholders can also be asked. After 6 months, asked again about the impact of performance.

Actionable feedback on how people perform after training is difficult in the manager not necessarily seeing all performance on the job

Competency assessment can be very expensive – solution is to do one extensive and follow ups are less rigorous

The quantity of the responses to follow up questionnaires falls off with time

Have to fill out surveys as part of Moodle – there may be some influence on the results when it is mandatory.

External (to the NMHS) students tend to be more honest in order to obtain certificates

Anonymous feedback – people don't necessarily trust that it is anonymous

Costs associated with training – challenge in benchmark of cost of face to face vs e-learning cost of time required to develop e-learning training. Using 3 cost levels with different types of training. Short shelf life more likely to go less expensive. Distance learning may not be the same cost savings in countries where travel is not expensive.

Simulations and looking a learning objectives – really focus on what people need to do like making good decisions. What do you want to intervene on with performance. Need to be updated every few years.

Evaluation forms – asking questions before and after testing the training (5 weeks afterward)

1-10 how comfortable are you with this topic (at the end, one month later).

Asking participants to evaluate 1)reaching, measuring if valuable, 2)learning, worth your time, 3)behavior (send to the director to evaluate) – testing 4) Satisfying objectives, competency

Responding to Challenges Beyond the New Normal

WMO Global Campus Collaborative Webinar

Action Proposal Template

Challenge Name: New Education and Training Needs (Group 8)

Participants included: Somenath DUTTA (MTI, India and WMO Capacity Development Panel), Dr. Revi kumar (QAS, Qatar), Carlos Recardo Wong Velarde (SENAMHI, Peru), Dr Ben Cosh (University of Reading), Kyaw Moe Oo (DMH, Myanmar), Aditya Warman (RTC Indonesia, BMKG), RTC China (CMATC, Beijing), RTC India (ICITC, New Delhi), Dr Patrick Parrish (WMO Secretariat)

Components identified	**Solutions** attempted by group members and suggestions for others	What **group members** can contribute to addressing challenges	How **collaboration** can contribute to addressing these challenge components	What **innovation implementation** challenges will be faced?
1 Updating the BIP-M and documenting alignment				
How does BIP-M evolve to deal with changing needs, given its very broad scope and length	It the BIP-M is too monolith and a system for incremental change should be established to respond to short-term challenges and rapid changes. There could be a regular cycle for incremental BIP-M Review, like that used in universities for curriculum revisions. This would require a Panel that represented RTCs, Met Services, Universities, and the WMO Secretariat. WMO technical staff might offer final approval of recommendations.	Ben Cosh, University of Reading Others TBD	Collaboration would be natural element of forming a Panel for ongoing BIP-M review. This would traditionally fall under the mandate of the EC Capacity Development Panel.	The difficulty of making changes to curricula, within universities in particular, make implementing incremental changes challenging. Changes might require new expertise.
How do we make sure we are aligned to the BIP-M?	Many RTCs have successfully updated their curricula, some with the assistance of outside institutions that have done the	WMO RTC Qatar can share their experiences	Institutions can offer to provide advice and	Documenting alignment might

	same. WMO provides a curricula mapping spreadsheet to aid institutions in making the alignment		guidance to those requesting assistance.	take up to a day or more. (also see immediately above)
2 Diverse needs				
The participants in international training events may have very different background knowledge and professional experiences. Their needs vary and cannot always be anticipated.	Design courses that address basic, common needs that can apply to all, as well as targeted courses (or course components) for unique needs. Allow some level of choice to students based on their needs.	CMATC can share their experiences.	Sharing learning resources between institutions may reduce effort in addressing unique needs. Some resources can be assigned or suggested to those in needs of special knowledge and skills	- Addressing the unique needs of all students may be laborious in international contexts. - Sharing resources is not common practice, although it is growing. Searchable online libraries of resources are needed, and not without cost.
3 Technician training needs				
Few specifications exist for teaching instrumentation operations and maintenance. Due to its goal of broad applicability, the WMO CIMO guide offers very good guidelines and background	Institutions may lack guidance for creating a curriculum for instrumentation operations and maintenance. The CIMO guide should be consulted, particularly Chapter 5 on Training of Instrument Specialists, as well as the competency framework for Instrumentation, calibration, meteorological observations, and observing system programme and network management. Institutions can also	WMO RTC Indonesia, BMKG can share their experiences and challenges.	Training providers in instrumentation and its varied skills can share their curricula and teaching methods.	Instruments may be evolving rapidly to address new data needs. WMO Members use instruments of varied levels of sophistication and from different manufacturers.

knowledge, but insufficient details for each instrument.	share their successful practices. The updated BIP-MT will also be a useful resource.			
New instruments are manufactured by researchers to gather data that aid in answering research questions. Technology transfer to applications creates a training need.	Guides for training can be developed to meet the needs of both teachers and learners. For inexpensive instruments, kits can be developed, along with demonstration videos, to allow self-directed learning.	University of Reading can share experiences	Collaboration and sharing with Group 1 will broaden ideas. Good practices might be documented on technical training at a distance, and also on site.	The rapid pace of changes in instruments and the infrastructure and competency gaps in many developing states create implementation challenges.
Different equipment (both types and manufacturer) used in different countries creates difficulties in defining training needs.	- If face-to-face training is impossible, online instrument maintenance courses are possible through online simulations for "hands-on" training. Group 1 also offers many solutions. - Courses can be designed to teach some of the most common sensors used in the countries of participants being served, if advance assessment is conducted. - Teaching the general principles of measurement can how they apply to different instruments can also help to broaden the applicability of training	CMATC and RTC India New Delhi component (IICTC) can share their experiences.	Collaboration and sharing with Group 1 will broaden ideas. Good practices on technical training online and on site would be useful to share.	(See above comment on challenges to implementation)
It can be a challenge to have all necessary or representative instruments in a single training institution, especially large,	- When necessary, training providers can send/take students to nearby operational centers local offices to learn about instruments not available at the training institution.	RTC India New Delhi component (IICTC) can share their experiences	Collaboration in the form of sharing experiences facing this challenge can help those who have no immediate solutions.	Cost factors could hinder travel to operational centers. Some local instruments might be unavailable.

expensive instruments like radars	- For international training at a distance, or after face-to-face training, hands-on exercises might be conducted in the local offices of participants.			
4				
Conducting a major training program to modernize services in a developing country requires addressing many needs at once, which can be disruptive.	Creating a well-organized and logically sequenced training plan with follow up that included training of trainers to sustain outcomes can help ensure lasting impacts.	- Myanmar can share their experiences working with many training partners in their World Bank project. - World Bank plans to develop a strategy for large-scale national needs assessment. - WMO EC Capacity Development Panel will be revising the WMO Capacity Development Strategy publication.	Sharing strategies for national needs assessment and a capacity development strategy.	Such comprehensive innovation implementation always bring challenges of organizing and sequencing, as well as sustaining outcomes.
5				
New areas of service delivery, such as Impacts based Forecasts and Warnings, Climate Services, WIGOS implementation, etc. create challenges to find training staff with the right skills (because the skills themselves are new). Some new areas of service	Training institutions and academic institutions should interact frequently with operational institutions to ensure they are up to date in understanding training requirements. Countries in which such partnerships exist have a better chance to succeed. Operational and educational institutions might even rely on exchanges of personnel to assist in education and training, as well as curriculum development.	University of Reading has a model than can share, and ideas on how it can be strengthened. Several RTCs such as SAWS and Argentina benefit from strong operations/academia collaboration, as well as others that can be identified.	Collaboration between national forecasting centers and academia are the thrust of this proposed challenge solution. Sharing models across WMO Members can help other partnerships form.	Not all institutions can innovate at the same pace. Finding expertise to help with the innovation can be difficult.

themselves may not be adequately described or understood in terms of needs.	Standard curricula can be augmented with short courses addressing new needs for more specific skills.			
6				
Training needs assessment is not systematic or continuous conducted to capture changes taking place rapidly. Data is not complete.	- Collect needs from students in courses as one source of data to complement data from PRs or managers. - Each technical division of an NMHS should have a team assigned to understand competency gaps within their division, which can then be shared with the training organizations. This would provider stronger feedback from operations. - Make needs assessment a regular Global Campus activity, over and above the WMO Community Platform data gathering. There may be a need for standard, intuitive, and well-guided needs assessment forms. - Make participation in needs assessment required to receive some benefits from WMO membership, such as application to attend some courses and degree programmes. - Needs assessment results can lead to a call for courses from WMO Member education and training institutions and WMO RTCs. - Regional or sub-regional meetings meetings between training institutions and operational institutions can help in clarifying needs for specific training initiatives.	- RTC India, MTI Pune can provide input on how needs assessment has led to changes in curricula. - Ideas were offered by University of Reading, Morroco DGM, SENAMHI, and MTI, Pune - Other WMO Members have additional experiences to share in national and regional needs assessment	Collaboration by sharing needs assessment strategies, by coordinating regional needs assessments, and by working with the WMO Secretariat to gather needs through the Community Platform.	Needs assessment is traditionally difficult due to limited participation, limited provision of the requested feedback. Guidance may be required, and may achieve better results than other forms of incentives and punitive measures.

Many NMHSs may not understand their own needs and how to communicate them to the regional association.	Many PRs may need guidance and support to gain sufficient knowledge about their organizations and WMO standards to effectively communicate their needs. They may need active engagement of their mid-level managers. WMO might help by bringing together national and regional mid-level managers (heads of divisions) to provide coaching on assessing gaps in meeting standards and doing internal skill audits through competency assessment. This might be done through online interactive workshops in which national teams also learn from each other in completing a guided process of internal skill audits. Alternatively, sub-regional workshops with specific focal points (such as WIGOS) might allow coaching that leads to better understanding WMO standards and addressing gaps.		Collaboration between NMHSs and Regional WIGOS Centers and/or World Meteorological Centers could be one of the approaches to promote understanding of needs in respect to meeting WMO standards. For example, best practices of WIGOS Centers can benefit the regional NMHSs in internal skill assessment. Some RTCs could also be involved in recommended workshops or training courses.	Not all regions have mature WIGOS Centers or other regional centers to collaborate with their regional NMHSs.
7				
WMO processes for supporting participants to regional training events do not always identify qualified participants.	RTCs might help, for example, by offering diagnostic testing to aid in the participant selection process.		Sharing such diagnostic tests would be a valuable WMO Global Campus activity.	Effective testing can be time consuming to develop and difficult to authentic results.

Interested Partners to continue exploration of the challenge: All discussion participants appear engage in addressing these challenges.