**Submitted Challenges (worksheet for assigning themes)**

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| # | Challenge Faced | Second Pass Themes |
| 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 learning4. 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 skills2. 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 skills13. 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.) |  |
| 31 | Mejorar los pronósticos en beneficio de la población (Improving forecasts for the benefit of our customers) |  |
| 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. | ~~9. Introducing 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 |
|  | Online student assessment |  |
| 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. | ~~12. Increasing the reach of education and training to more people and audiences~~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 learningGeneral  |
| 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 learning6. 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 skills6. 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 populations4. 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; adapt face-to-face courses to virtual mode; develop and implement a blended learning approach. | 4. Developing general online teaching skills/including blended learning, adapting existing courses |
| 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 (100)) | ~~12. Increasing the reach of education and training to more people and audiences~~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, we could plan the translation of key training activities, resources or information (which are not being undertaken by WMO) | 6. Collaboration in education and training |
| 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? | 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 context3. Online student assessment |
| 95 | 3) Improving networking with RTCs and with other institutions (Eumetsat, Calmet, Copernicus, Comet,...). | 6. Collaboration in education and training |