

Please add your challenges raised in virtual delivery, your thoughts on addressing it.

Whatever you use, test it first!

Challenge identified	Potential ways to address the challenge	Updates 2021
How to avoid exhausting your trainees (especially in a short course) with too much livestream?	Pre-records of some material to watch in their own time (potentially beforehand as homework?); keep livestream elements interactive; allow flexibility in sessions so people can step away from their screens. If leaving pre-recorded material should be short videos. Students will not sit and watch a pre-recorded material that is too long (~1h or more). Use short videos interleaved with exercises. Incorporate significant breaks between sessions; include some live but 'on your own' activities to cater for introverts Consider whether the topic really lends itself to a virtual environment and whether you have access to the appropriate compute. Better to cancel some courses than to try and make them all work in a virtual environment. Consider having more helpers and specify roles (instructor, helper, tech support). Encourage participants to brainstorm and engage in peer-to-peer learning - eg. by working on	Too much screen time is still a problem. Enthusiasm tapers off after 30-40minutes. Information overload. Short course experience is different - more likely to watch videos and come armed with well formed questions. For a short course: pre-record all the lectures, serve them in about 10 min long videos, and make a list of questions that the participants answer based on the videos prior to the course. Use all the course time for hands-ons and discussions. Make sure that some professors enrol as participants in your (short) course. Questions and comments are guaranteed. Do NOT use breakout rooms for questions. Once the participants see that others have similar questions, even the shy ones dare to ask theirs. For LMICs: Consider making it clear since the beginning that you intend the course to be interactive and that students are welcomed to

	challenges together in a breakout room. Reduce class sizes and more frequent breaks. Have larger teaching team, take turns at teaching Split course into short sessions over multiple days Design virtual courses with good amount of breakouts Better to spread the course over many days Maintain a good balance to Lecturing and practical/hands-on sessions	interrupt the teacher to ask questions → This helps keep them follow For LMICs: some curricula make students follow courses with no real “interaction” with the teacher exist (very hierarchical systems) so some students tend not to follow “critically”. So consider making it clear since the beginning that any critical review of the course content is welcomed. Give small activities (look at a website, a plot online, run a quick command, etc) during the class so that students engage for a few minutes. Ask questions to students allow to keep them captivated
Scheduling across time zones	Pre-recording can help here. Having only part of the sessions live and, if possible, in a time that is ok for most people Work on your own exercises, with very detailed instructions so that people don’t need to attend a live session. Combined with a channel to ask questions If it’s short, it may be possible to run it twice (start and end of the day if based in GMT) time zone If possible, split into predetermined slots of no more than two hours with 2 h breaks in between; be clear that it’s OK to munch on video! We would often have working lunches or networking drinks and	Judit Kumuthini: Hybrid of pre recorded and face to face, run more than once if necessary. At Least The group exercises of a particular training should be at the same time. We did not find any ideal solutions other than to recognize that it takes effort and resources to staff with live people and sessions suitable for every time zone. That might mean teaching a lecture more than once or recording a lecture and having teaching assistants or instructors online to discuss at early morning or late night times for the local time zone.

	nibbles if we were delivering face-to-face courses. Find overlapping time zones and repeat sessions for extreme timezones People may be flexible within a certain window- eg +/- 3 hours seems to work here in Australia. Sessions could be repeated or multiply scheduled to offer some choices to accommodate. Multiple time zones have been especially an issue for us where assessment is concerned, which I note is discussed in another row here. State clearly which time zone you will be using, and announce it clearly. Add a little tool to convert time zones in the course description for those who are bad in math like me.	
Addressing questions outside of live sessions	The use of online forums have been a great way to address questions at any time. Structured forums even more useful - can refer back to questions that have previously been addressed Slack space to stay connected post workshops Virtual drop-in sessions after events are a great idea. We have in the past had good success with Piazza even for regular in-person classes. The students	We have successfully implemented using a GDoc that was built up during the Course, by participants and by the trainers. All comments and questions from the Zoom chat were also put in the GDoc. Trainers came back later to answer in the GDoc all the questions for which there was no time during the session. And other participants answered too. It has become a very valuable document for all to go back to. We create Slack workspace for each module and this remains available even after the course and

	can keep odd hours compared to us and appreciate having ways instructors or peers can see and respond to questions at all hours. Shared Google document. Advantage: Everybody can see all questions and answers. Disadvantage: Some may not feel comfortable asking a question in this more public way	interaction continues. People continue to ask questions and instructors respond or share experiences Many Universities are investing in commercial software where all the above tasks and data are managed more easily. This way intellectual property rights stays within the university and sharable content is shared to be FAIR. Use of Learning Management System
How to assess your students (especially in HEI settings)	Questions need to be questions around reasoning and structuring; the answers shouldn't be googlable Assessing on work they do during the course more than in a final exam whenever possible. Evaluate more on projects or "real life cases" where each student will develop a project or will have a different setting to guarantee not two cases are equal. It is a lot more work to grade. Hard to know if students are taking help when doing exams virtually - there have also been cases when students posting questions online to seek help. Exams with live cam have been considered.	How to make assessments transparent?
Access to content outside of virtual sessions i.e. lecture	Using a Learning Management Platform (LMS) addresses most of these issues provided you have	

slides and other materials	enough storage space Most organisations particularly universities have an in-house system already Youtube to make video lectures widely available - depending on copyright of material Make the course longer with shorter periods of contact time There are some initiatives, such as CourseSource, that are trying to make materials more broadly available so people can share their validated and open materials more easily and benefit from those others have shared. Google sites is easy to use and you can easily add google tools or url Google classroom	
No access to YouTube recordings in some countries. Also a question: What other platforms discussed here cannot be accessed in different countries?	Host recordings elsewhere. Maybe interesting to collate a list of platforms and countries. https://d.tube/ is a decentralized youtube-like platform built on https://ipfs.io/ . Due to its decentralized nature, it's often used to circumvent country restrictions.	Countries not allowing YouTube: • China • Eritrea • Iran • North Korea • South Sudan • Syria • Tajikistan • Turkmenistan

		As far as I can tell many video sharing platforms are blocked in these countries. Perhaps an alternative is to put videos on a file sharing site? What about mega.nz? It has its own online media player, and 50 gb of storage for free accounts. It's an advantage compared to other platform that requires downloading the contents to see them. Zoom, Slack and other platform from US, cannot be accessed from Cuba
Dealing with potentially larger audiences when transferring face-to-face courses into virtual sessions	Make lectures available to anyone but practicals available to a selected audience; get them to do exercises together in small breakout rooms, encouraging them all to keep their cameras on all the time to encourage them to ask questions More helpers and breakout rooms Run polls to gauge the mood and progress of the learners	May need to run multiple live contact sessions to accommodate larger numbers.
Ensuring active participation of trainees in the hands-on sessions Breakout rooms, cameras off, not engaging... Engaging atmosphere in online teaching	More than ever using the Train the trainer tips: being aware of the problem (if trainees don't actively participate, it may be because they are left behind), constantly asking feedback from trainees, checking where they are in the exercises, be prepared to make them actively participate - making trainees answer an exercise in front of others or give their answers in the chat box (for those that don't feel comfortable talking online or being seen online), share their screen with others,	In the hands-on sessions for a high end workshop we conducted recently, the challenge was no-show by some participants. At the end of the 10 day workshop every participant would get a certificate that is usually considered valuable. Thus, to keep them motivated 80% attendance was kept as a minimum criteria to receive the certificate. We had AnyDesk remote login to access Linux/Unix OS to run the commands, coordinate with participants via WhatsApp chat and giving

Building mutual trust among participants Need better sense for classroom culture in online classes - no standard expectations. May be different for different age groups or cultures.	Use small groups where the technology permits. Create meaningful tasks that trainees will actually want to participate in, and make very explicit what the purpose of a task is and how it contributes to learning outcomes. Set expectations clearly from early on in the process, eg at the application stage if relevant, and in introductory sessions. For short courses it's especially important to cultivate social connections so that trainees form bonds with each other and are motivated to learn together. If possible, allow for flexibility in how a hands-on task is accomplished - e.g. allow comments via multiple channels for a discussion based task, or allow an alternative of searching for relevant resources for learners who can't complete a practical task. Make guidelines or best practices document on expectations to give participants upfront Make sure students introduce themselves and possibly an unrelated question to "break the ice" Assign an activity to encourage interactions Slide with questions - "Are you following" etc., people reply with Y/N in chat. Instructor comments on responses Monitor shared google doc for people participating (or google collab?)	regular reminders. If possible, employ teaching assistants and have breakout rooms with smaller numbers to increase interactions. Prepare interesting questions around the topic to promote discussion - maybe even something controversial around the topic. In the Galaxy training this year (GTN Smörgåsbord and other), each topic was given a Slack channel. Each Slack channel had a pinned "FAQ" document that was populated as challenges were encountered. This helped somewhat to increase participation, but also having a #social channel with active engagement helped too. Answer hands-on questions in slack chat versus in zoom chat or by opening the microphone in zoom. In our experience (Vera at EBI) all options are viable. You need to provide clear instructions about how participants can ask for help. The other advice is to provide more detailed instructions. Trainers can go through the questions in share screen mode as well.
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	Slack channel is sometimes not used; tools need to be introduced and how they will be used, otherwise they are not useful Reduction in the number of tools; standardization of which tools to use State the aim of the interaction each time you switch modes of teaching/learning/platform e.g. pet channel in slack is to share funnies about pets. E.g. to comment on posters here Keep a short title/summary/aim on each page (About)	
“Convincing” trainers that going online is possible/feasible (easy)	Show them the benefits: learn new techniques, learn new tools, revamp their content, make their content even more interactive. Show it to them with a short training session about how to use a tool Show some feedback from both trainers and trainees from a course that has already run. Giving support to them all the time, before the course, during, after. Write step by step process with screenshots Make suggestions on settings to use in the online teaching platforms Run through a mock teaching session with them Tell them how to call for help. Provide more help during first few sessions	Provide access to regular training events on using the online training platforms etc. to overcome the fear of adapting to new technologies.

	If there has been one silver lining to the covid situation in academia, it may be that this is less of an issue than it used to be because most instructors have been forced to do it and realize it's not as hard as they thought it would be. It also helps that tools are much better than they were a few years ago and people who remember nearly unusable video conferencing systems from 5-10 years ago might be persuaded just by experiencing the more robust and user-friendly tools available now.	
Variability in the bandwidth of different participants	If people can't video, encourage them to have a photo Don't continue classes until every student has good access to the network capacity they need. In ZA, some students were following classes on their mobile phones; the University is couriering laptops and buying data packages for their students to ensure that everyone has equal access to their education If a student is having bandwidth issues to join a live session. one solution could be to provide all the material to download beforehand and they can call in to the session to follow along or ask for help This is a particular problem for long-term courses in Low and Middle income countries. We have tried lending computers to students but some of them	Currently, most of the classes/sessions are in audio mode to conserve bandwidth. Since the pandemic started, several universities have now zero rated data to specific teaching/academic sites (also YouTube in some instances). Material can be placed on these sites to avoid excess bandwidth usage to stream.

	moved out of the city and can't be reached. We don't have the money to pay for data plans for all the students and some are in areas where they don't have internet access. Reaching them is very hard and they have been very frustrated and dropping courses because they can't get the learning experience they expected. Test the environment as if you were a student. Think about what set-up you can expect each student will have?	
Differing consent/copyright for sharing lecture material, especially datasets	Difficult to address but we request that all lecturers/trainers make use of "open educational resources (OER)" at all times to ensure we never infringe on copyright, etc. - <i>this needs to be thought about though</i> May need a two stage process: make materials available in a closed forum that participants can access using a log-in, and after the course is finished, curate the material to decide what can be made available more widely. Obtain appropriate consent / licences from the start of designing the course. Make sure all instructors understand what the status of material they contribute will be. For me a major obstacle has been sharing material created by students, either deliberately e.g. project outputs, or incidentally e.g. recordings of live	

	discussions / seminars which will have student input.	
Trainers and trainees are both 'in their comfort zone' with lectures - many switch off when courses move from lecture to interactive activities	Need to put extra effort into expectation setting, and into preparation with the trainers (this is proving to be really tough as we try to virtualise our 'managing a bioinformatics core facility' course, which is incredibly interactive. Sarah is doubling up on both the programme support and the events support compared with face to face events "Convincing" trainers that going online is possible/feasible (easy). Training managers (organizers) do need to facilitate this process with trainers: making training sessions with trainers before the course takes place to show them how to use the tools/platforms. Also with trainees to make them more comfortable before they get to the class and to check any possible technical problems they might have.	
Organisation / preparation /coordination tasks pre-courses	Have all prepared in advance and accessible to the students Set up a well organized index, topics schedule and timetable of the course Have all documentation, practical and hands-on materials, as well as speaker presentations ready before the start of the course. Have all these materials well organized and	

	structured following the schedule of the topics and a clear timetable of the course.	
Students not used to the online training are getting lost when several resource documents are provided	Provide a clear “roadmap” of what is to be done throughout the training, even by including a clear introductory session presenting all the resources. + Take time to provide a document for that, so that students can go back to it at their own pace.	Minimise the number of places where information/documentation for the course is made available
Language barrier	We had teachers speaking too fast for some students. It is important that virtual trainers are clearly advised to speak slower. This is important when the course is delivered in a language that is not the students native tongue. Very hard to follow certain accents or when they talk too fast. In general for both virtual and f-t-f, it is good idea to speak in a pace that everyone can follow If lectures are recorded and available on Youtube, the automated captioning/subtitles added to videos works quite well for english subtitles Provide a glossary. Ideally, get students to collaborate on extending and improving the glossary - even for native speakers this helps to make sure they understand technical concepts. Text versions of any spoken material are highly	Zoom now provides live transcripts - although not always accurate.

	desirable if at all possible. Full transcripts might not be practical (especially for live sessions) but make written notes available as an alternative. Make space for students to ask questions or ask for something to be repeated if they didn't understand the first time. Explicitly encourage checking understanding in this way. To ensure high quality audio, it is worth investing in equipment such as an external microphone. Of course we're all working from home and can't ensure a quiet environment with low background noise etc, but we can at least try to minimize it.	
Too many repetitive questions for facilitators or teaching assistants helping the main trainer with the questions	Students doing exercises might not be able to follow on the live chat for questions raising from virtual classmates, and this might bring repetitive questions to the teaching team → waste of time → Need to allow the teaching team (Trainer + teaching assistants/facilitators) to set the record straight each x min and answer to the whole audience examples of important questions raised → benefit to the whole team and audience	Common, repetitive or complex questions can be addressed on the course platform/forum.
Lack of resources in poor contexts/countries- some students do not have laptops and other necessary tools needed for learning Lack of support- be it emotional,	Raise funds or ask for donations for the students and staff? Look for virtual support structures such as mentors, tutors, counsellors that students and staff can call /email/contact for assistance	Some universities have recognised the need to provide counseling and support to students struggling with the transition - provide support structures and counseling services to students. Use platforms and tools which can be used also from smartphones could be a good idea for making

academic, psychological etc Social unrest- politics, family etc how do we ensure that our trainees and trainers exist in conducive environments free from macro/larger disturbances? The loss of the face to face Human element Internet connection is something that can be unreliable/slow in people's homes and is expensive.	This is a very important issue, students going through depression. Constant discussion/counseling will help these students. Some of them are stuck in student dormitories due to travel bans etc, they need emotional support. Counseling and support people are going through their own crisis of trying to figure out how to offer their services online to serve what's become a big need. From an instructor's point of view, part of what we've had to do is learn what is being done and convey that to students so they know what resources are there for them.	the classes more accessible
Live sessions are not suitable for a class split across multiple time zones	Recording live sessions and making them available in a video repository (YouTube/other?) for people to catch up on in their own time	Hold live Q&A sessions during reasonable times that overlap time zones.
How to try and add social/community building elements to your multi day training events Maybe linked to this as well, is how to create a classroom environment and encourage interaction between participants.	For our upcoming summer school we will test having a forum, with facilitators adding to the social discussion, a virtual poster session through the forum and zoom coffee breaks We have had a lot of concern from students feeling isolated and struggling in class as well as more generally. We've tried to develop a number of online social activities outside of class, both real-time discussions and offline social events and	

	competitions in which students can participate. I'd also add it's been especially an issue for students who are stuck away from family and perhaps afraid to go home because they might not be able to return. We have encouraged our virtual classroom teaching assistants to create Whatsapp groups with participants to allow for social interaction as well as support between participants. We encourage participants to make use of the chat facility on our LMS for social interactions. To encourage interaction between participants in our virtual classrooms we have introduced the concept of forming Open Learning Circles for participants who would like to share concepts, ideas and knowledge around any particular topic of interest.	
How to get honest feedback from the attendees? How to improve the number of people providing feedback. We had quite a low number of respondents to webinars/online classes	During the introduction to the session was mentioned requesting to open the cameras, which could be helpful, but is not always an option. It was mentioned as well, to provide a step by step document. Makes it easier to follow the class, and the attendees tend to ask more when they have it. Non-verbal feedback (e.g thumbs up and down in zoom or a poll in slack) are good options too. In my experience highlighting the importance of their feedback is useful. If the attendees or students realize that the feedback is used to	

	reshape the sessions or course they will be much more willing to participate and provide the feedback.	
What is the ideal instructor/TA - participant ratio for the more advanced training?	For training so far 1 instructor/helper to 5 -6 people For more advanced - maybe need less trainers?	
How are others sharing for participants to access software and datasets materials requiring e.g. VM set-up/cloud-based VM/other options	We've tried cloud compute on a ResOps course. It worked really well. But the trainers were the Cloud Architects, so they are very familiar with it and could set it up. I don't know how much work would it require if you don't have that We've also delivered one course with the participants installing software via BioConda packages, sending instructions before hand and allowing them to ask questions if they had any issues For Virtual Machines, we also sent instructions on how to get access. This was only in a command line setup via ssh. Anyway you do it, I think it's key to have a clear list of requirements participants need (e.g. if they have to install something that only runs in Linux, they need to have Linux machines) and then send detailed instructions about how to install/access it and who to contact in case you run into trouble. We have GitHub pages set up in advance of a workshop with installation instructions for all tools	We've explored using singularity containers and workflows and VMs. Each has its advantages and disadvantages. VM experience was mixed - had issues with downloading a large VM image and other technical issues setting it up - Less downstream technical issues. Singularity containers and workflows were also a challenge without having a F2F classroom and technical support but still worked well. Needed to have lots of online support to address technical queries.

	needed, pre-readings, lecture slide decks, exercises and data sets. Where a cloud environment is needed, one is set up in Amazon (education credits used) and students are given their own instance with the necessary tools pre-installed and datasets in S3 bucket. Made use of Singularity containers and workflows for more advanced courses so that individual software does not need to be installed. Different containers developed based on different parts of the data analysis steps. We are going to trial this approach this year without having physical classrooms. Previously we had technical assistance at each classroom site.	
How do we ensure learning is happening (or at least, an environment is created where learning could happen)?	I've tried to go back to basics (and still trying to figure things out!) and ask: what are the learning objectives and how are we going to assess it is happening in real-time and after the course? This is good practice for face to face and virtual delivery, and for the latter it may provide a point to reflect on before forming sessions that aid the learning process for as many people on the course as possible. The answer to the question is likely "produce good assessments, set up polls for real-time feedback from trainees"	Running of regular assessments (MCQ) quizzes for a multi-module course. Link outcomes from the practical components to questions assessed in the quiz. Have very well defined objectives
Dealing with the misconception that virtual training is scalable	Emphasise to peers the difference between outreach and training; emphasise the importance of retaining key learning outcomes, and the need	

	(which most of our peers are now personally familiar with) to allow for the fact that participating in videoconferences is more physically and mentally draining than participating face to face I do think that it is worth distinguishing the portions of training that are scalable, such as recorded lectures or automated interactive tools and assessments, from those that are not so we can at least be as efficient as possible in using limited time of instructors. Perhaps delivery is more scalable than in a classroom (hence the commentary from peers) but is assessment more scalable and also is the nature of assessment equal in virtual training or more difficult.	
Computational requirements and power, not only for any hands-on tutorial you want to run, but also to run any videoconferencing or other tool you are using. Zoom is using quite a bit of my CPU right now. It would be hard to use another computationally demanding programme at the same time. In addition, older versions of operating systems might not	Check the requirements of the tools, try to use something that is as broad as possible. We have had a lot of guidance that one has to have backup options such as recorded lectures, as mentioned elsewhere, and also need to avoid anything critical for students that might be a problem if they are unable to get online at a particular time, such as having multiple opportunities for interaction and avoiding high-stakes assessments.	

support some of the tools you want to use.		
How to deal with work from home/office virtual environments that spill into the training session? Sounds are easy to deal with as you can mute participants, but other things will pull a student away from the virtual classroom (e.g. children needing attention, fire alarm so need to evacuate the building). Such intrusions should not impact the whole class if well facilitated, but will impact the individual and extend/impact their learning. What is the best way to prepare for the distant environments each of your student may have? Or should the trainer not concern themselves over this too much?	What Russell mentions just above can help here as well: have back-up options and alternative ways for interaction. If a participant has to leave a session because of a child, they could access a recorded video later on or follow the exercises on their own and ask questions in another channel (forum, slack, email...) Flexibility in time taken to undertake a task or read content. This is probably easier in a virtual environment than in a classroom or short training course environment if students can access content on demand rather than being 'present'.	
How to adjust the virtual space for optimal learning	Check light, sound, 'position' of learners in the screen space, explain the screen space, use non verbal communication cues ...	
How to keep learners interested	Any online material is more interesting and keeps the attention on if it has some interactive elements; use of simulations, games, themed discussions and 'free style' chat rooms	Using interactive tools like menti, social networks for challenges, informat channels for communication. Ment+1

Accessibility and inclusiveness	Subtitles, downloadable pdfs/docs, alt text ... Pre-recorded content Inclusive learning blog post	
Code of conduct (a Virtual Code of Conduct)	Introduce it early: raising hand to talk, asking questions, troubleshooting and help, moderation .. Provide trainees with guidelines on how to get in touch with trainers/organizers with complaints?	
Multimodal ways of communication	Perhaps not a big problem to the 'digital natives' but if we want to be inclusive some prerequisite is needed	
Online persona	Allow this to be expressed through photo, video, avatar, background as this will help inclusiveness - it is to do with the image we want to project rather than what our physical reality really is - this helps with inclusion	
Synchronizing grading and prerequisites between remote and in-person offerings of a course	We have spent a lot of time discussing this issue, e.g., what do you do if a course is a prerequisite for another and now is covering less material because it is online. Probably the most important thing for us has just been to be aware this is an issue and make sure both courses are acting reasonably and not penalizing students for issues out of their control.	
Students feel they are being "cheated" by getting an online	I agree, this is the problem - virtual will never replace the 'real' it was never meant to replace it,	

instead of in-person education. This has been an issue in a number of US universities where students are choosing to defer their studies or demanding refunds of tuition because they feel they are not getting the education they expected. Same in UK (and probably in other countries with high tuition fees)	but rather to either enhance it or add some aspects not possible in f-t-f courses. Universities are now talking about 'hybrid' model with virtual plus f-t-f in small groups which is more fair and probably better value for the money On the training side, the feedback I received so far is that trainees are very grateful for the chance to continue learning online (instead of no training at all), with so many interesting interactions live.	
Some of our students want to go back to the classrooms and some want to stay virtual, and due to the mandatory physical distances we will not be able to fit all the students in the same classroom, so we might have some students in the classroom and some virtual. Any suggestions or tips to deal with both f2f and virtual at the same time?	The more human resource you have the easier it will be to manage different groups, for simultaneous attendance of virtual and f2f audiences, having multiple TAs available to triage questions, comments etc would be ideal.	
Adaptation of content from in-person to online. How do you adapt your content when you may be less likely to be able to deliver it as you had originally planned, as is currently the case		

where delivery online had to happen very quickly. How do you handle practical exercises? Do you replace them with demonstrations and if so, what impact does that have on the learning. What elements of your course has to change? How do you assess the course? How does it impact the students experience of the course and what they learn from it?		
I don't know if it is out of scope, but dealing with the problem that some kind of instruction cannot be put online or not without major compromises and a degree may depend on students making progress in that to stay on schedule or have prerequisite knowledge for later classes. Lab classes are the prime example for us but there are others.	For lab classes, I've seen a demo of Labster in my previous university teaching role, this may be quite expensive though.	
Although screen sharing is possible, sometimes having control of the computer on a practical session is easier. Is there a good tool for this type of interaction?	Teamviewer allows one user to take control of another's mouse (and keyboard I believe?) but I haven't seen it used outside an IT-support setting. AnyDesk: tool (with free version) to take control on another's computer remotely.	

	Apparently GoToMeeting offers keyboard and mouse control, although for security reasons some applications may not be accessible via remote keyboard/mouse unless GoTo desktop app is opened at admin level. In Zoom, in breakout room, a participant can also give the remote control to someone else	
Are there lessons that can be learnt from MOOCs? They have been in existence for many years. They could be considered to be quite different from virtual teaching but they are successful and very popular. What are the secrets to their success and can we adapt them to the virtual classroom or virtual training environment?		
The human factor, how to handle lack of in-person interaction with students in the case university setup and networking in the case of virtual conferences, workshops, summits etc Good ice breaking activities	Human factor - University setup: A regular followup of teaching staff, both lecturers as well as additional teaching assistants with students will reduce the gap of not having f-t-f interaction. Tools like slack, whatsapp will greatly help to handle Q&A outside lecture sessions. Human factor in virtual conferences, workshops, summits: Provide a match maker tool in order to	

	facilitate networking of interested participants. Organise virtual coffee lounges during breakouts for interested people to meet & chat. Either create specific sessions for networking/icebreakers or integrate them into teaching sessions. Finding a way to host “water-cooler moments” in online courses would be great to enable conversations for those who wish to engage in this. Aidan Budd et al have run unconferences and I’ve heard of icebreaker activities where participants are put into specific groups based on something they all have in common.	
When delivering webinars/live classes it is difficult to keep your eyes on the presentation, remember what you’re supposed to be saying and monitor the platform to see if there are questions from the students all at the same time. This is generally more of a problem for webinar based events where you have a larger class and all the students are on mute with no screen sharing.	We have employed a tactic of having two other colleagues monitoring the chat box and answering questions in real-time. Obviously this has its own drawbacks: students writing in the chat will not be able to keep up with the webinar Ideally this could be further helped by having smaller class sizes as discussed, pausing regularly and factoring in time for questions Apart from extra trainers monitoring the chat, it’s good to have someone only to monitor the class, e.g. mute anyone who forgot, check for any “technical issues” on the chat...	

How to handle special student populations: gifted, at-risk, and special needs students	Some additional material or different levels (exercises, practicals) needed to serve different student populations.	
In short courses offered for free, there's a high proportion of people who register and don't show up in the end. If you want to keep the number of participants low (15-30), because of the availability of trainers, compute, etc..., but then 10-15 people don't come, you only teach very few participants	We are considering asking for a no-show fee. When we send reminders for the course we ask them to tell us if they cannot make it, so that we can give the spot to someone else (most people don't reply to this, but you get some responses).	

New challenges and highlights 2021

Challenge	Potential solution	Notes
Shift to (even more) people signing up for things they don't intend to attend, increasing no-show rate.	Increase the hurdle requirements for attendance to filter out serious contenders eg. application process or small fee? Clause agreeing to full participation and attendance in the course on the application form which must be agreed to. We have also	Not unique to virtual but maybe worse for virtual. It is easier to cancel/not turn up for virtual. Is it a cultural shift? People have become wise to signing up gets them the links

	put in an idle threat “Non-attendance may lead to a fee being incurred for the course”	SIB - people signup for a minimal fee but still don't turn up and ask for the link Level of commitment varies between webinar vs workshop/course. We need to make it clear what the expectations of participants are to fully participate in the course.
People are overwhelmed with information and don't watch the pre-recordings		In short courses at EBI it has been the opposite
Screen time still a big problem	Agreeing to shorten the length of sessions	
Everyone assuming that online is free to attend		It is actually more expensive in terms of man power and needing to buy in extra compute and software etc
No shows. What's the problem with people not turning up?	Can a small fee be applied for no shows? Is it worth the effort? Does it make a difference? Cambridge Uni used to charge via the student's supervisor and kept a black list EBI offsite workshops - if the minimum number of people don't turn up the host is charged Would time limited access incentivise people to turn up?	Capacity is limited for hands-on workshop and no showing up takes a place of someone else who could have benefited from the course. It's also frustrating from an organisational perspective.
Challenge of consistency between software versions where trainees are running on their own machines (as opposed to eg supplied	Containerisation / VMs could help here as discussed above, challenges in distributing?	Connection to a remote server or a HPC can be an alternative

laptops or computer lab), bioinformatics pipelines may give different results		
HIGHLIGHT - Introvert/shy personalities are thriving in virtual environment, asking more questions and potentially learning more	Continue with hybrid models to facilitate different personalities	
HIGHLIGHT - Trainers are less exhausted as they don't need to travel! Better work life balance		
Timezone challenge	Repeat delivery in 3 time zones? Have TAs available in different time zones?	
Overcommitment challenge because virtual means you can simultaneously attend/work on multiple tasks; over-estimation of time and attention		
Asynchronous activities. Participants do not tend to do Asynchronous activities	When using asynchronous activities, make them short and simple. If the practicals are important, it needs a facilitator or teacher synchronously.	
Pending inequity problems as countries are disproportionately vaccinated. Vaccinated countries switch back to F2F events which non-vaccinated countries cannot attend		
HIGHLIGHT - Better reach for short courses, conferences, etc. More geographically dispersed individuals can attend		

HIGHLIGHT - More speaker choice as travel is not a barrier		Hope this continues past the pandemic, but does require committing to a hybrid model
HIGHLIGHT - Cost savings as no travel is required, so one can participate in more activities/events		
HIGHLIGHT - May help work life balance for at least some students as well as instructors		
Bandwidth and electricity challenges in low-income (and sometimes high income) countries make everything virtual difficult		
Intrinsic technical problems of virtuality.		
Lost opportunities for other educational innovations because education professionals are all committed to pandemic response.		
Motivate students / participants to work through with pre-course material	One mechanism raised is scheduling lessons or formal deadlines for covering pre-requisite content (so that it seems “part of the course”). Attendance at lessons can then be tracked or a quiz delivered to test whether pre-requisite knowledge has been gained ahead of starting a course/workshop. Completion of prerequisite content could also be conditional for enrollment into a particular course. Effectively utilizing a LMS is also vital - often these systems have a variety of tools built in to allow active tracking of trainees (for	

	example, tracking and delivering assignments/quizzes, forums, chats, etc.). Important to remember the efficacy of LMS's to actively manage and track trainees.	