

Remote Training of SRL Users and Staff in a Global Pandemic

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• Abstract

The impact of the COVID-19 pandemic on training and Shared Resource Laboratory (SRL) operations such as staffing, facility access, and social distancing, has affected facilities around the globe to different degrees based on restrictions set by various geographical and institutional settings. With these restrictions come unique challenges regarding user and staff training and education, for both theory and practice. Most notably, limitations in facility access, occupancy, staffing availability, network restrictions and trainee engagement call for innovative solutions for training when traditional in-person options are not feasible. Through the use of remote access tools and pre-recorded educational and training materials, SRLs are able to overcome these obstacles. Here, we focus on readily available technologies and general guidelines that SRLs in different environments can use for remote cytometry training and education, while highlighting key obstacles that still remain. Although SRLs may face initial struggles in transitioning trainings to a virtual format, remote technologies provide unique opportunities to advance current training programs. © 2020 International Society for Advancement of Cytometry

• Key terms

training; remote access; education; flow cytometry shared resource

THE COVID-19 pandemic has majorly impacted work and daily life around the globe, including academic and nonprofit research sectors. Many research and Shared Resource Laboratories (SRLs) were forced to close or severely reduce operations with little notice. As daily operations are now returning, SRLs are finding ways to adapt to new regulations and recommendations that keep staff and users safe, while still providing the best possible quality and throughput of service.

One of the primary services of an SRL is training, which typically entails a mix of classroom and hands-on training with formats ranging from larger classroom style to individual instruction at the instrument. To mitigate widespread SARS-CoV-2 infections, in-person cytometry training is not recommended until physical distancing rules are relaxed, which is in accordance with individual institutional, state or national policies. These policies and newfound restrictions bring with them a variety of obstacles for training that can be overcome with the use of remote access technologies and prerecorded educational and training content.

In this communication, we first present an in depth review of challenges observed for training in the SARS-CoV-2 era, followed by an overview of commonly utilized remote platforms currently available and general guidelines for their implementation into a remote training platform. Lastly, we discuss the obstacles that remain and opportunities for collaboration between SRLs to enhance global cytometry education and training.

LOGISTICAL LIMITATIONS

Institutional Precautions

Precautions for all individuals returning to work at a research institute, hospital or medical campus are well covered in CDC and other regional guidelines (1-5). These institutional restrictions have impacted access and usage of SRLs across the globe. Even with the assumption that all SRL staff and users have been cleared for work, certain institutional safeguards may have been put in place that can cause challenges in SRL training, such as:

- Implementing workspace layout changes to adhere to distancing guidelines
- Occupancy rates
- Additional cleaning requirements to ensure instruments are properly decontaminated between users
- Masking of all employees, patients, and visitors
- Restriction or prohibition of travel for training purposes
- Restriction on vendor visits for training unless directed by institute or local authority
- Transition of all large group meetings to a virtual format

Staffing Limitations

The response of different SRLs to geographical and institutional restrictions imposed due to the COVID-19 pandemic has been exceptional. Due to the rapid and dynamic nature of the situation, within very short time frames either governments or institutions implemented policies resulting in partial or complete shutdown. These limitations posed unique challenges to SRLs in their ability to provide services, including training users. In Figure 1a, the 2020 data clearly show a decline in usage and training due to the restrictions imposed in response to the global pandemic. As users returned to the lab, SRLs were able to meet the initial demand from experienced users while adjusting to the new policies and restrictions affecting hands-on training. This adjustment period may account for the lag in recovery of training rates. This highlights the importance for all SRLs to have a response plan in place outlining how they will feasibly provide remote training services, as all SRLs are susceptible to these abrupt changes. Additionally, SRL staff need to be comfortable providing such training for users. Safety, ability to use remote training tools, ease of interaction with users, as well as staff morale, all factor into the level of engagement that staff may exhibit for training users.

Hiring and Training New Staff

The full impact of the COVID-19 pandemic in terms of hiring and training new SRL staff is still being determined and presents a unique set of issues. These issues can include border closures that prevent potential employment of staff from different regions and hiring freezes that affect overburdened SRL staff.

However, actually being able to employ new staff during the lockdown period presents its own set of problems, from keeping new staff busy during a full lockdown, to training them to operate the more manual cell sorters from a safe

distance. For complex cytometer training, social distancing makes it awkward to demonstrate the finer details and nuances of set-up, operation and troubleshooting. SRL staff attempting these types of in-person trainings can utilize enhanced PPE according to local guidelines along with laser pointers and social distancing; however, these limitations can be burdensome and may require significantly longer training times, as compared to pre-pandemic hands-on cytometer training.

THEORETICAL AND HANDS-ON TRAINING CHALLENGES

Virtual Theoretical Training and Engagement

Most SRLs require classroom-based theoretical training before using SRL equipment. This theoretical training often takes place in a didactic, slide-based format that is easily amenable to virtualization. Even so, one of the main challenges of this virtual transition is maintaining engagement in the absence of face-to-face instruction. User engagement is critical for a successful education platform and the results achieved, or lack thereof, can be linked to emotions associated with learning a new technology, such as anxiety and stress. Both positive and negative emotions have been shown to have an impact on some aspects of learning, such as memory and problem solving (6), and therefore needs to be considered to create a meaningful and productive learning experience. Remote learning makes it difficult for SRL staff to assess subtle facial and body language cues to gauge user comprehension and associated emotional reactions. Additionally, users may be dealing with extra distractions and may be less willing to ask questions if they cannot observe that their peers are also struggling with the content.

User Experience Levels

Many SRLs are challenged with how to support and train users of varying experience levels in a virtual format. The needs of the individual users are unique and the virtual training needs to be customized. Supporting novice users on virtual formats may require significantly more time as compared to what is typical for in-person training, subsequently increasing the burden to SRL staff.

Language Barriers

As many training sessions are transferred to a virtual platform, clear communication is key to ensure the user fully comprehends the content and instrumentation being taught. Research institutions around the world are typically represented by a large variety of international researchers, and therefore it is common to train users who are not fluent in the language native to the SRL institution. During normal circumstances, when presented with these language barriers, in-person demonstrations are often used to get messages across. The in-person teaching demonstrations are lost over a virtual platform, creating a unique challenge in the ability to ensure all users access to the same level of training and education.

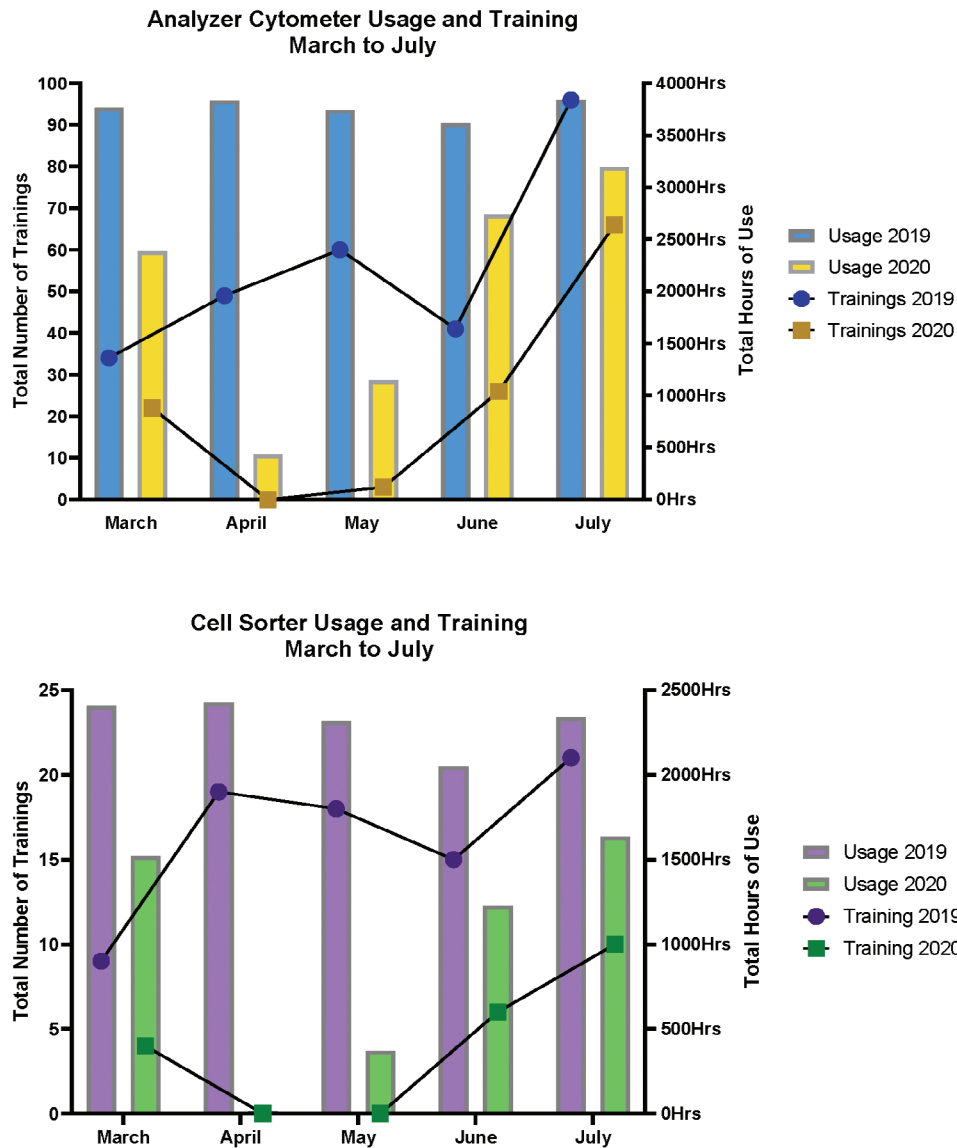


Figure 1. Analyzer and sorter usage vs training. The sum of all instrument usage hours and number of trainings in eight SRLs across the globe from May 2019 to July 2019, compared with May 2020 to July 2020. [Color figure can be viewed at wileyonlinelibrary.com]

Remote Proficiency Assessment

When training in-person, the user's comprehension and physical competency at the cytometer is easily assessed and corrections can be made in real time based on observations. Once the SRL staff and user are not in the same physical space, accurate assessments regarding proficiency levels of the user become more difficult. This can be due to suboptimal audio and visual connections from SRL staff or user, ease of distraction when working remotely or poor communication. Without an accurate assessment of proficiency whereby SRL staff can confidently deem users as able to operate independently, there is an increased risk of poor practices at the instrument and subsequent poor flow cytometry experiment execution and results.

Data Analysis

While bench work is suspended, cytometry users are taking the opportunity to devote more time to data analysis. With this increase in analysis comes an increase in requests for training on a variety of cytometry analysis software. SRLs can use this as an opportunity to develop programs that meet the increased simultaneous demand for analysis training and consultation without putting a burden on SRL staff.

Infrastructure and Data Security

Many SRLs operate in institutions that have restrictions on data security, purchasing requirements, and patient safety, which severely impact transitioning SRL training to a virtual format. These restrictions not only impact training but also

remote troubleshooting and data management (7,8). This transition requires tools such as video conferencing platforms, VNC software, webcams, headsets, web-based file sharing, and social media to create and share training content. Some institutions restrict choices for these tools in an effort to protect research data, patient information, and brand identity. Purchasing limitations have also exacerbated wait times for high-demand products such as webcams and headsets.

With the need to access user data and instruments for remote training, it has become critical to have instruments networked to allow for external access. Many instruments depend on proprietary software that may not be compatible with the most modern and secure operating systems and institutional IT-mandated virus protection. Such workstations are often barred from network access, limiting remote access for staff and streaming of live software walk-throughs and demonstrations. SRLs handling human samples may face additional security concerns related to protection of patient data.

SOLUTIONS TO TRAINING OBSTACLES

Remote Access

Remote access tools as a viable training method have been introduced in the past (9). Currently, the implementation of these remote virtual training platforms has become much more accessible with the existence of newer tools, such as those mentioned in Section “Infrastructure and Data Security.” Figure 2b and Table 1 summarize some platforms SRLs are currently using and their capabilities for remote training. Individual SRLs should consult with their IT departments to review these options and decide which meet their institutional requirements. Using video conferencing platforms with hardware such as cell phones, wireless headsets, or Bluetooth microphones, enables us to rethink and redesign training to become fully remote. For hardware, high-quality video and audio is key during these sessions.

Theoretical Training and Proficiency Assessment

To better determine user proficiency and comprehension during remote theory training, lectures and teaching styles should be adjusted to incorporate more formal breaks to allow users to ask questions. Inclusion of polls and surveys for feedback will not only shed light on information retention and understanding, but it has also been shown to create a more interactive and enjoyable end-user experience (10). Studies have also suggested that the use of student response technologies in scientific lecture-style classrooms increases the chance of student attendance and participation, with surveys of students indicating they felt a better understanding of the subject matter with their use (11). Some of the currently popular virtual meeting platforms (Fig. 2a), allow SRL staff to set up polling questions in advance and release them at the appropriate time. As an alternative, polling can also be set up through other free platforms. Polling questions should be distributed across the presentation and may even be structured as a pre/post-test format to gauge effectiveness of the session. If

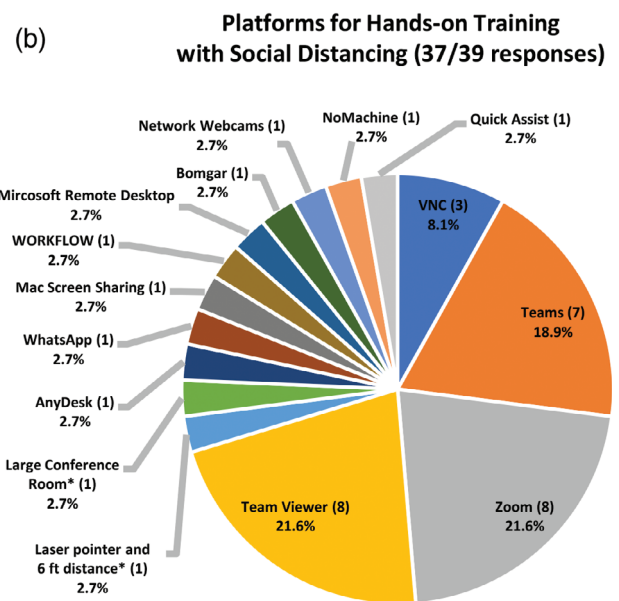
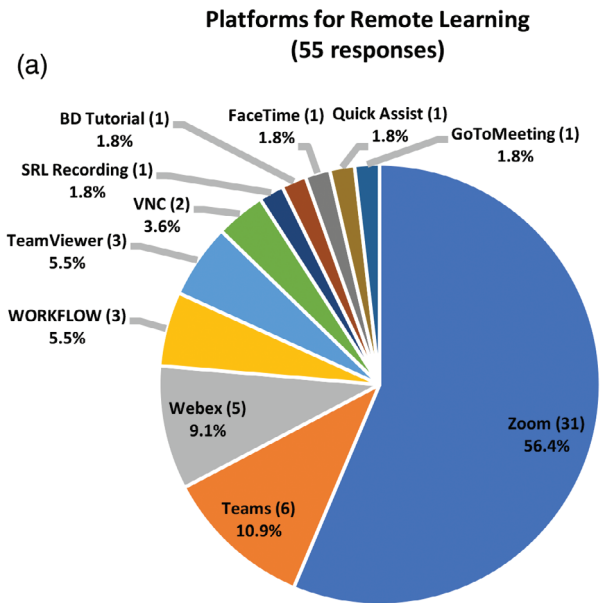


Figure 2. Available platforms for remote learning and hands-on training with social distancing. (a) ISAC SRL Content TF survey 2020 was sent out through the Purdue List. Fifty-five SRLs of the 62 that completed the survey responded to this question. The pie chart shows the platforms these SRLs used for remote learning. (b) ISAC SRL Content TF survey 2020 was sent out through the Purdue List. Thirty-nine SRLs of the 62 that completed the survey responded to this question. The pie chart indicates the platforms these SRLs are using for hands-on training under social distancing requirements. Platforms indicated with (*) were physically in-person but adhering to social distancing. Two out of the 39 SRLs responded that they did not adhere to social distancing requirements but used what they termed as “appropriate PPE.” [Color figure can be viewed at wileyonlinelibrary.com]

Table 1. Overview of remote platforms

COMMONLY USED REMOTE PLATFORMS	WINDOWS AND MAC COMPATIBILITY	MOBILE APP	SCREEN SHARE	REMOTE ACCESS	HD VIDEO	RECORDING CAPABILITIES	SHARED SCREEN ANNOTATION	SUBTITLES	COST	THEORETICAL/HANDS-ON TRAINING COMPATIBLE
Zoom	✓	✓	✓	✓	✓	Local or cloud	✓	Third party or manual	Subscription required for meetings longer than 40 min	Both
Microsoft Teams	✓	✓	✓	✓	✓	Cloud	No. Whiteboard only	English only by Teams	Free with Office 365 license	Both
Team Viewer	✓	✓	✓	✓	✓	Local or cloud	✓	No	Subscription required	Both

Summary of capabilities offered with the most commonly used remote platform tools as referenced in Figure 2b.

poll responses can be linked to individual users, it may allow for the identification of those who may be struggling with the content and allow staff to follow-up with further support.

SRLs located at institutions with licenses to software capable of proctoring and proficiency exams for compliance topics such as biosafety or hazard communication training may be able to create various modules for assessing knowledge of flow cytometry theory and practice.

Training Across Experience Levels

Training options set forward in this communication focus on in-house user training by SRL staff; however, many vendors and third-party educators provide online training options, which are recommended as a supplement to SRL training programs (Supporting Information Table S1). A simple YouTube search regarding specific instrumentation or applications will also populate a variety of results from across institutions and vendors. Outsourcing cytometry education can be beneficial, as most options have been already digitized and are ready for on-line or remote consumption. However, SRL managers should check the quality and credibility of the provider to ensure the provided content is correct and of an appropriate standard.

Novice users will benefit from being able to train remotely on acquisition and analysis software in advance of their remote hands-on training session at the instrument. Many cytometry companies now offer copies of their software separate from the instrument, either as a download or a dongle. Directing new users to practice on software with the assistance of pre-recorded videos will allow for a more effective training process.

Although more advanced autonomous users tend not to need as intensive hands-on training as others, they often benefit from being supported remotely at instruments. It is recommended that SRLs have a clear protocol and the proper video conferencing and remote access tools in place so these experienced users can be confident in reaching out for remote training and assistance when needed.

SRL staff typically require deeper hands-on training in order to have a more comprehensive knowledge of instrumentation to appropriately troubleshoot problems and subsequently train users. There is a clear need in the cytometry community for instrument vendors to provide comprehensive virtual hands-on training modules that cover fluidics basics, instrument quality control, alignment, maintenance and cleaning, along with troubleshooting tips for commons issues.

Training Videos

Even with the ability to connect to users via video conferencing platforms for instrument training, there are still a range of manual interventions that cannot be adequately taught simply by connecting to acquisition software or even by the inclusion of SOPs. In these scenarios, the SRL is recommended to have video recordings easily available that the user will watch in advance of the hands-on training to become familiar with the process. Topics can include: fluidics

maintenance, optical filter swaps, sort chamber cleaning, handling and placement of nozzles, nozzle clog removal and other instrument specific idiosyncrasies. Videos should be easily accessible to the end user as a point of reference when it is not safe or practical for SRL staff to be physically present. Users should be able to access these recordings from the desktop of the instrument or their own personal device. Additionally, QR codes (12) linking specific areas of training and operation to recordings can be displayed beside each cytometer, so the user can access these during or after the training session.

When creating training videos, use the following guidelines to facilitate the best content:

- Clearly define material that will be reviewed
- Keep videos short and to the point
- Remove unnecessary background audio with video editing software (i.e., iMovie, Adobe Premiere, etc.)
- Apply voice over and subtitles for better communication
- Use cameras that capture high-definition video
- Record close-up shots when intricate instrument handling is required

Hands-on Training for Basic Instrumentation

For users and new SRL staff who need to learn how to run cytometers independently, hands-on training to orient them to software and instrument handling is the next step to demonstrate how theory translates to practice. Training on instruments such as analyzers and compact sorters can be done with the user in front of the instrument and designated SRL staff guiding via remote access platforms. If the appropriate hardware (e.g., webcams and speakers) is not available at the instrument, users should be made aware well in advance that they should be prepared to join in on sessions from a personal device, such as laptop or cell phone equipped to connect via audio and video. Clear communication about connection methods is key to ensure an effective training experience. These training sessions should be recorded and provided to the user for reference and review.

Hands-on Training for Complex Instrumentation

Understandably, there are significant technical difficulties involved in remotely training a new SRL staff member or user on less automated, highly complex instruments. With more complex instruments, such as cell sorters, it is suggested to carry out an initial video conference session where SRL staff is operating the instrument, while the user is remotely accessing the instrument computer. This allows the staff to show all the steps required to operate the instrument while giving the user ample opportunity to ask questions. Alternatively or in supplement, pre-recorded videos highlighted in Section “Training Videos” can be used to prepare users before the first hands-on training session.

Staffing Limitations

To account for SRL occupancy restrictions, SRL staff can work from a remote location on-site or at home where they are still able to carry out virtual theoretical and hands-on

training, as long as the infrastructure is in place. Clear and constant communication should also be held between the SRL and users, so everyone is aware of delays in training availability and appropriate experimental planning can occur. In addition to hands-on remote training, SRL staff may also work on training manuals and SOPs from outside the lab.

Language Barriers

Prerecorded videos for instrument training will prove to be an invaluable resource in a time of social distancing. Implementation of subtitles in these videos allow for clarity and ease of understanding when the audio quality is low or a language barrier is present. Creating subtitles for these training videos in the native language of the research institution, in addition to the most commonly spoken languages by users of the facility, will allow for an inclusive learning environment. Additionally, this creates an opportunity for collaboration between SRLs across the globe to share training material and potentially provide translation services for each other, while expanding educational content for a more diverse group of users. Groups such as ISAC, ICCS, ESCCA, and affiliated regional societies could be called upon for members to aid in this effort, or aid in organizing efforts in this area for SRLs globally.

Group Data Analysis

In addition to carrying out individual training sessions for troubleshooting on specific datasets, interactive virtual group training sessions allow for SRL staff to concert their efforts and make best use of their time. Allowing for all attendees to interject with any questions or comments throughout the session allows for a more interactive, transparent training.

By carrying out virtual classrooms on a routine basis, SRLs provide a valuable resource where users can join when available to learn software basics, nuances or specific applications of which they were previously unaware. Recordings of these sessions should be made easily available to all users of the facility for easy access and reference, in addition to directing them to supplementary virtual materials (Supporting Information Table S1).

Network Restrictions

Solutions to virtual training in the age of COVID-19 rely heavily on the presence of robust internal and external network infrastructure. Institutions that do not allow for networking of computers running outdated operating systems or systems that may contain protected data will be restricted in what they can offer for training. In these scenarios, users may be able to take advantage of personal mobile devices if those are allowed in the lab and can get sufficient signal to support voice and data connections. Alternatively, coordinating with institutional IT departments to put pressure on vendors to provide software updates compatible with modern system architectures and network requirements at reasonable rates would provide the most long-lasting solution. SRLs can provide a united front in demanding continued product development to address evolving IT requirements and ensure that

outdated systems do not remain such a challenge for future operations.

If none of these solutions are feasible, the SRL may not be able to offer the full suite of training as they may be limited to prerecorded videos stored on local workstations. With that in mind, it is important to recognize that the full scope of hands-on training cannot be carried out without the ability for the user and trainer to connect in real time via a network connection.

New Instrument Training

Training on new instrumentation is now being offered remotely by many companies. Using appropriate communication tools can work quite well to allow quick ease of getting to know the instrument. Ensuring the SRL has the appropriate communication tools and materials in place for testing and training will be essential. If training reagents cannot be provided by the vendor, it is recommended to work with on-site users or explore commercial options.

DISCUSSION

Within a very brief timeframe, SRLs around the world were faced with the incredible challenge of redefining their education and training platforms in the new age of social distancing and institutional/regional restrictions. With this challenge came the realization that a virtual platform was essential to continue to support research through remote training and education.

For an SRL to keep training effectively and efficiently, there is a strong need to set up well-defined communication channels from the beginning between the SRL staff, users, and the institution. As network connection is key, advance knowledge of the latest institutional policies for antivirus and remote connection software, as well as manufacturer recommendations, will save time and trouble. These institutional policies and network restrictions remain one of the largest roadblocks in virtual training and remote access. In the absence of a network connection, it is not possible to sufficiently train users in hands-on operation of instrumentation without a real-time connection.

Ensuring the appropriate training hardware and software infrastructure is in place is critical for a successful remote training program, both for theoretical and hands-on training aspects. Once in place, a clear workflow, as outlined in Figure 3, for remote training can be executed by any SRL.

While these hardware and software tools make it possible to train users, there are still deficiencies in available options for hands-on training for more complex instrumentation. Cell sorters, for example, can require manipulations in hard to visualize areas of the instrument that are not easy to show via an external camera source. Instrument vendors need to recognize what is lacking in the way of instrument monitoring tools and implement technologies that allow for visualization of more inaccessible areas of the instrument to allow for improved remote training. For online education, as these tools become more readily accessible to everyone and widely

used, there will be the need to implement more automatic learning assessment tools, attendance verification throughout the presentation, and embedded attendance reporting tools, among other features.

Keeping in mind, the diversity of users within research institutions, a comprehensive set of clear and concise training materials will prove invaluable to both SRL staff and users. By providing this material, both written and recorded, and having it easily accessible before and after live training sessions will allow for an effective learning environment across all experience levels. Required training materials will vary depending on the application and complexity of the content, and considerations should be made to accommodate these differences in training materials provided to users and SRL staff.

The shift to remote training brings with it the need for assessment tools to determine effectiveness. The use of online feedback or survey tools can and should be used to assess the efficacy of remote training courses. Questionnaires can also be used to understand the knowledge base of users and what is required to increase competency and skill levels.

Now that SRLs have been forced to adapt their training programs to virtual or remote platforms, one of the remaining questions is how these tools will evolve and be used in the post-pandemic era. Although it is important not to speculate, it is safe to say that the need to switch to fully remote trainings, led to widespread institutional subscriptions of remote online delivery platforms, which will allow SRLs to continue to provide live online theoretical courses and webinars. The widespread availability of remote tools will also facilitate their use in hands-on trainings, though the advantages of in-person training are still significant. Even though this transition to a virtual format has been seen as an obstacle, maintaining remote capabilities can actually provide an opportunity for SRLs to advance their training programs by including remote capabilities to in-person sessions. For instance, taking advantage of the established remote connections, SRL staff can “drop-in” remotely to follow in-person user trainings, troubleshooting, and assisted experiments carried out by another staff member, thereby increasing exposure of all staff to such training opportunities.

Such a quick transition to virtual training platforms has shed light on the importance of collaboration. Repeated efforts can be avoided if the community unites to form a consensus on best approaches for remote training and combines efforts to provide open and global access to educational content. This collaboration is key not only between SRLs focusing on cytometry, but also between SRLs across a variety of technologies commonly used by researchers. Partnerships of organizations such as Euro-Bioimaging, BioImagingUK and ISAC would prove invaluable as they would allow for a more diverse portfolio of training and educational material available to scientists. The interconnectedness of SRLs and the role they play in scientific research can and should be highlighted in training platforms. As a scientific community, we are presented with an opportunity to join efforts across core

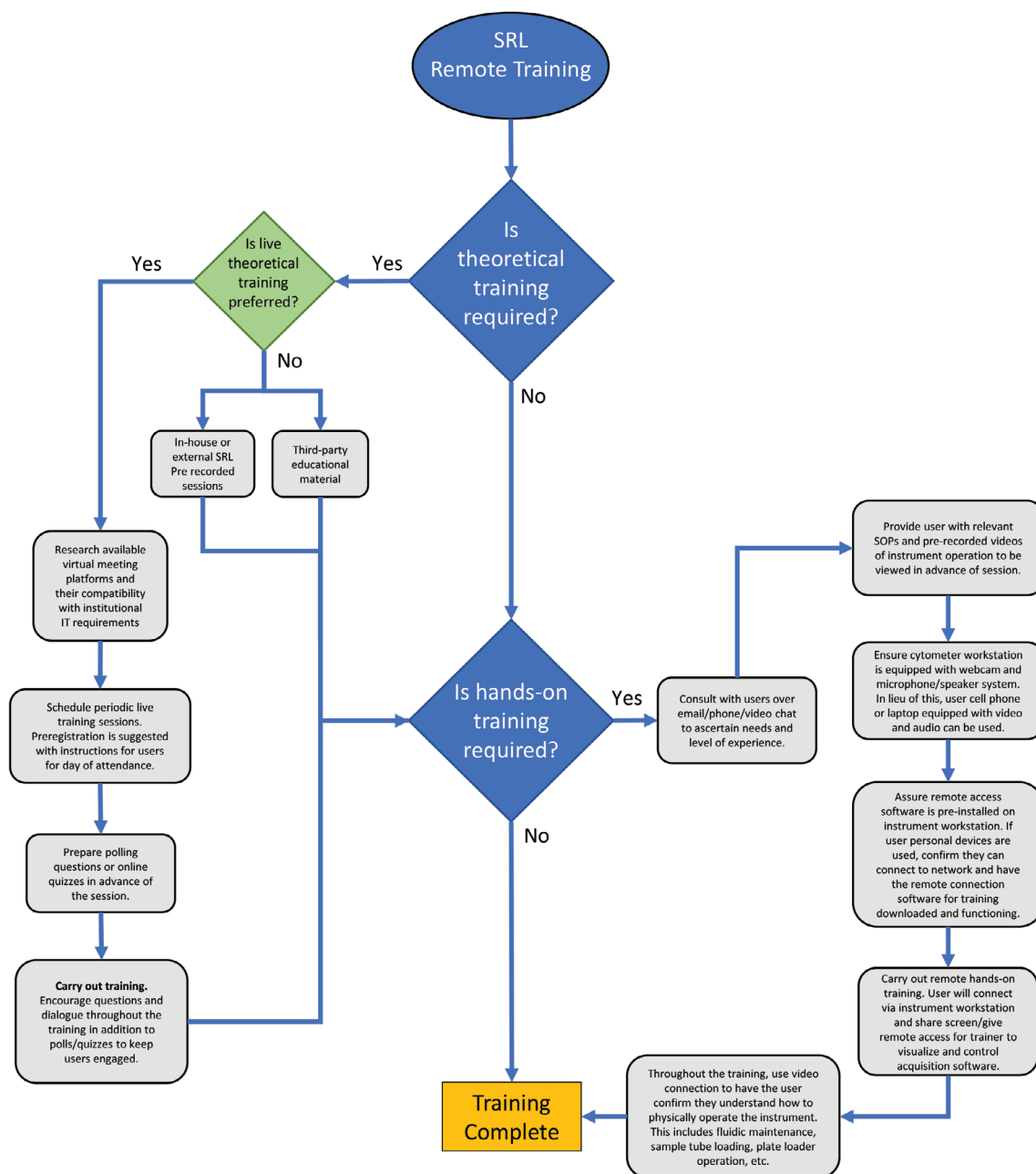


Figure 3. SRL remote training workflow. Suggested workflow for remote theoretical and hands-on training when in-person training is not feasible. [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1002/cyto.a.24262)]

technologies to provide a comprehensive, cross platform virtual educational and training platform to enhance research worldwide.

AUTHOR CONTRIBUTIONS

Kathleen Daniels: Visualization; writing-original draft; writing-review and editing. **Alexis Conway:** Writing-original draft; writing-review and editing. **Rui Gardner:** Formal

analysis; visualization; writing-original draft; writing-review and editing. **Lola Martinez:** Writing-original draft; writing-review and editing. **Kylie Price:** Writing-original draft; writing-review and editing. **Sarah Schneider:** Formal analysis; visualization; writing-original draft. **Rachael Sheridan:** Writing-original draft; writing-review and editing. **Jane Srivastava:** Writing-original draft; writing-review and editing. **Sherry Thornton:** Formal analysis; visualization; writing-original draft.

LITERATURE CITED

1. Returning to Work. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/returning-to-work.html>; 2020.
2. European Centre for Disease Prevention and Control. Available from: <https://www.ecdc.europa.eu/en>; 2020.
3. COVID-19: back to the workplace in safe and healthy conditions. Available from <https://osha.europa.eu/en/highlights/Covid-19-back-workplace-safe-and-healthy-conditions>; 2020.
4. Working safely during coronavirus (COVID-19). Available from: <https://www.gov.uk/guidance/working-safely-during-coronavirus-covid-19/labs-and-research-facilities>; 2020.
5. Guidance on Preparing Workplaces for COVID-19. Available from <https://www.osha.gov/Publications/OSHA3990.pdf>; 2020.
6. Tyng CM, Amin HU, Saad MNM, Malik AS. The influences of emotion on learning and memory. *Front Psychol* 2017;8:1454.
7. Gravano DM, Chakraborty U, Pesce I, Thomson M. Solutions for shared resource lab (SRL) remote quality control and resource troubleshooting during a pandemic. *Cytom Part A* 2020.
8. Black M, Moncada Gorena K. Data management solutions for SRL's: Leveraging automation and remote storage. *Cytom Part A* 2020.
9. Moran B, Blanco-Fernández A, Gardner R, Tigges J, Toxavidis V, Daley JF. Remote access technology offers tremendous possibilities to the cytometry community. *Cytom Part A* 2013;83A:1062–1065.
10. Kappers WM, Cutler S. (2014) Poll Everywhere! Even in the Classroom: An Investigation into the Impact of Using PollEverywhere in a Large-Lecture Classroom Paper presented at 2014 ASEE Annual Conference & Exposition, Indianapolis, Indiana.
11. Greer L, Heaney PJ. Real-time analysis of student comprehension: An assessment of electronic student response Technology in an Introductory Earth Science Course. *J Geosci Educ* 2004;52:345–351.
12. QR Code Generator. Available from: <https://www.qr-code-generator.com>; 2020.