LabTwin

Report

VOICE-POWERED METHOD-DEVELOPMENT FOR PROTEIN EXPRESSION

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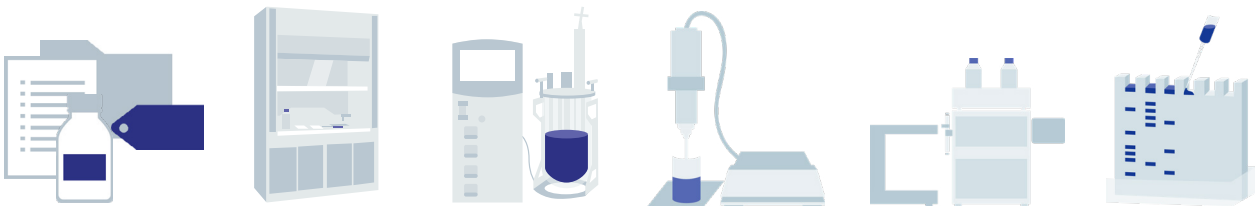
When the human genome was sequenced in 2003, it became possible to identify the gene and protein changes that occur in various diseases, such as cancer. Ever since, the field of proteomics has been booming to respond to the ever-increasing prevalence of chronic diseases. Today, the global market for therapeutic proteins is valued around US$100 billion.

One of the major problems faced by biopharmaceutical companies is clinical trial failures—only 12% of drugs tested in clinical trials will get marketing approval. This means that, on average, companies must develop and test around eight compounds in order to get one approved. Companies are looking to improve these odds by employing new technologies, such as artificial intelligence (AI), alongside traditional tools like mass-spectrometry (MS) or high-performance liquid chromatography (HPLC).

Complex technologies can produce very large datasets and scientists now face the challenge of managing huge amounts of data. Accurate documentation is key to getting the most value out of experimental data. For example, method-development entails constant adjustment of multiple parameters and therefore requires precise documentation of each step and decision.

Fig.1: Workflow overview for the method-development of protein expression



1 Preparation of the experiment

2 Small-scale culture of infected cells

3 Large-scale culture for protein expression

4 Protein extraction

5 Protein purification

6 Quality control (SDS-page, MS,...)

7 REPORT

77%
of LabTwin users say that LabTwin really improves method-development

+50%
increase in reproducibility

+34%
more details recorded

Scientists working in method-development for protein expression report saving 2h30 on their typical workflow by using LabTwin's voice-powered digital lab assistant instead of classic documentation. Moreover, researchers report that LabTwin helps troubleshoot experiments by allowing precise documentation, in real time, at the point of experimentation.

KEY CHALLENGES

> Documentation of time sensitive experiments

> Reproducibility & troubleshooting

> Data loss and data silos

OUR SOLUTIONS

> Hands-free recording

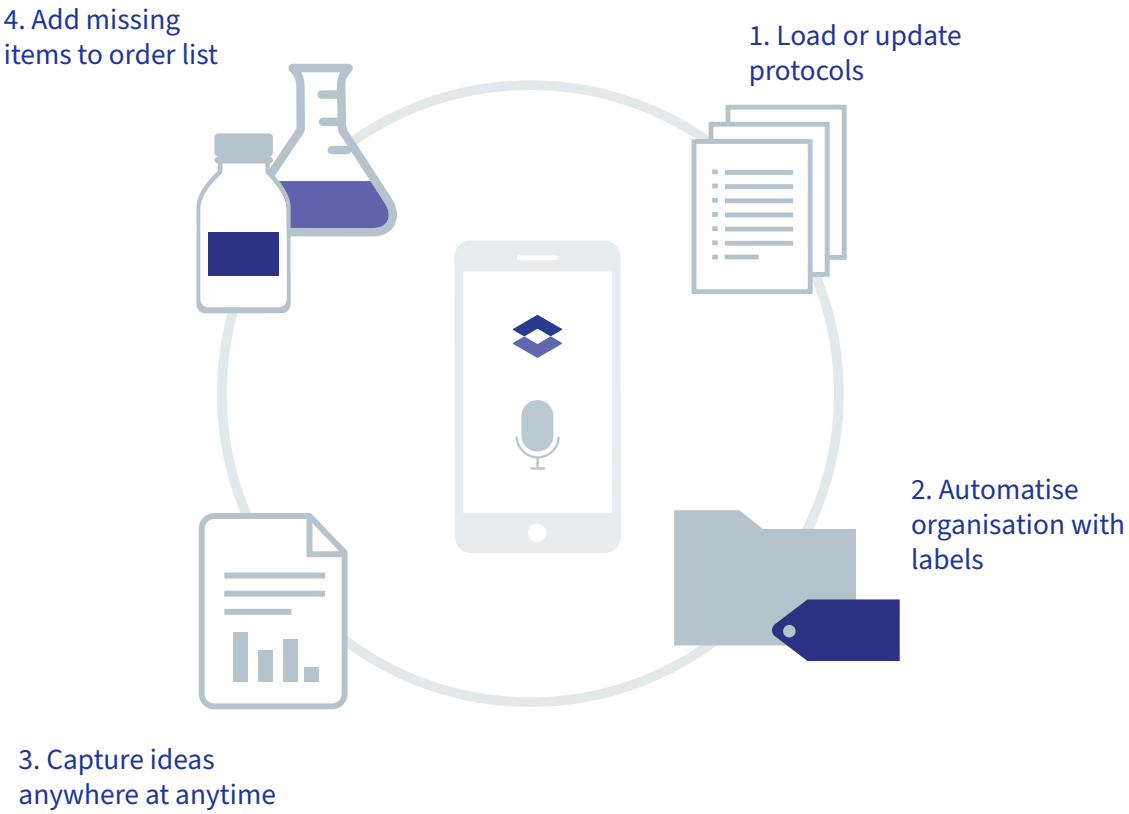
> Empowering richer notes

> Automatically centralized digitalization

1. PREPARING AN EXPERIMENT

Planning an experiment involves updating and printing several protocols and then carrying these protocols around the lab. Once at the bench, scientists often add notes to protocols during experiments. Paper loss between different workstations, damage from chemical spots, as well as difficulties reading protocols while performing experiments, are daily challenges faced by scientists.

Fig2: LabTwin support for experiment planning and preparation



By loading or updating protocols in LabTwin, scientists can access their protocols, simply by using their voice, anywhere and at any time. Scientists can also create a label at the beginning of each workflow. LabTwin will then tag every note taken during this workflow. At the end of the experiment, the scientist can easily collect all notes and details by using this label.

Scientists report that LabTwin helps them prepare for experiments by simplifying the process of capturing ideas and adding any missing lab items or reagents to an order list.

> "LabTwin helps me to capture my ideas in real-time during the planning phase and gather them in one place."

LabTwin User
Scientist, Top 10 Pharma Company

2. SMALL SCALE CULTURE OF TRANSFECTED CELLS

The first step in protein production is to express the protein in a cell line. Culture conditions need to be optimized to maximize cell survival (pH, temperature, cell density, etc). Most of the work is carried out under a sterile hood and scientists have to wear gloves to avoid contaminating their cultures. These conditions make it difficult for scientists to read protocols or write down observations without interrupting their workflow. Therefore, researchers often try to memorize a lot of information, for example the position of various samples within a 96-well plate, until they can access a computer.

LabTwin's voice-activated digital lab assistant is hands-free and allows scientists to work seamlessly at the hood. The digital assistant reads out protocol steps and immediately captures observations, such as batch numbers or sample positions. Scientists save time and strongly reduce contamination risks by keeping their hands gloved and focused on their experiment.

> "Before LabTwin, I was relying on my memory to report which samples are in which positions."

LabTwin User
Scientist, Top 10 Pharma Company

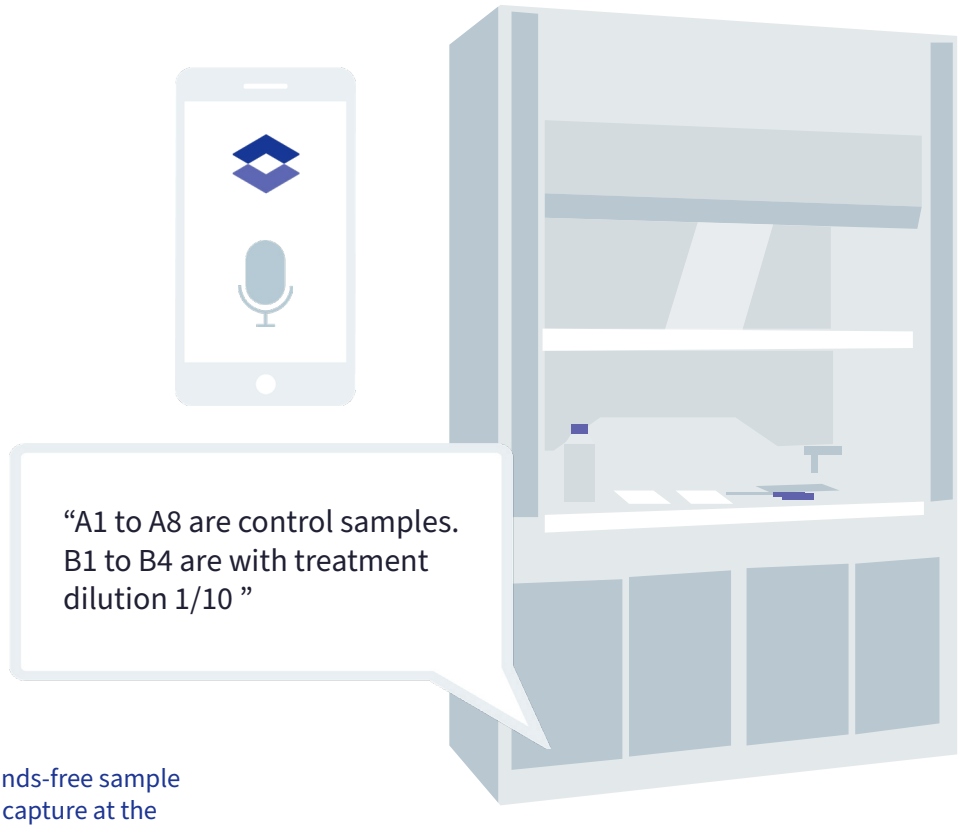


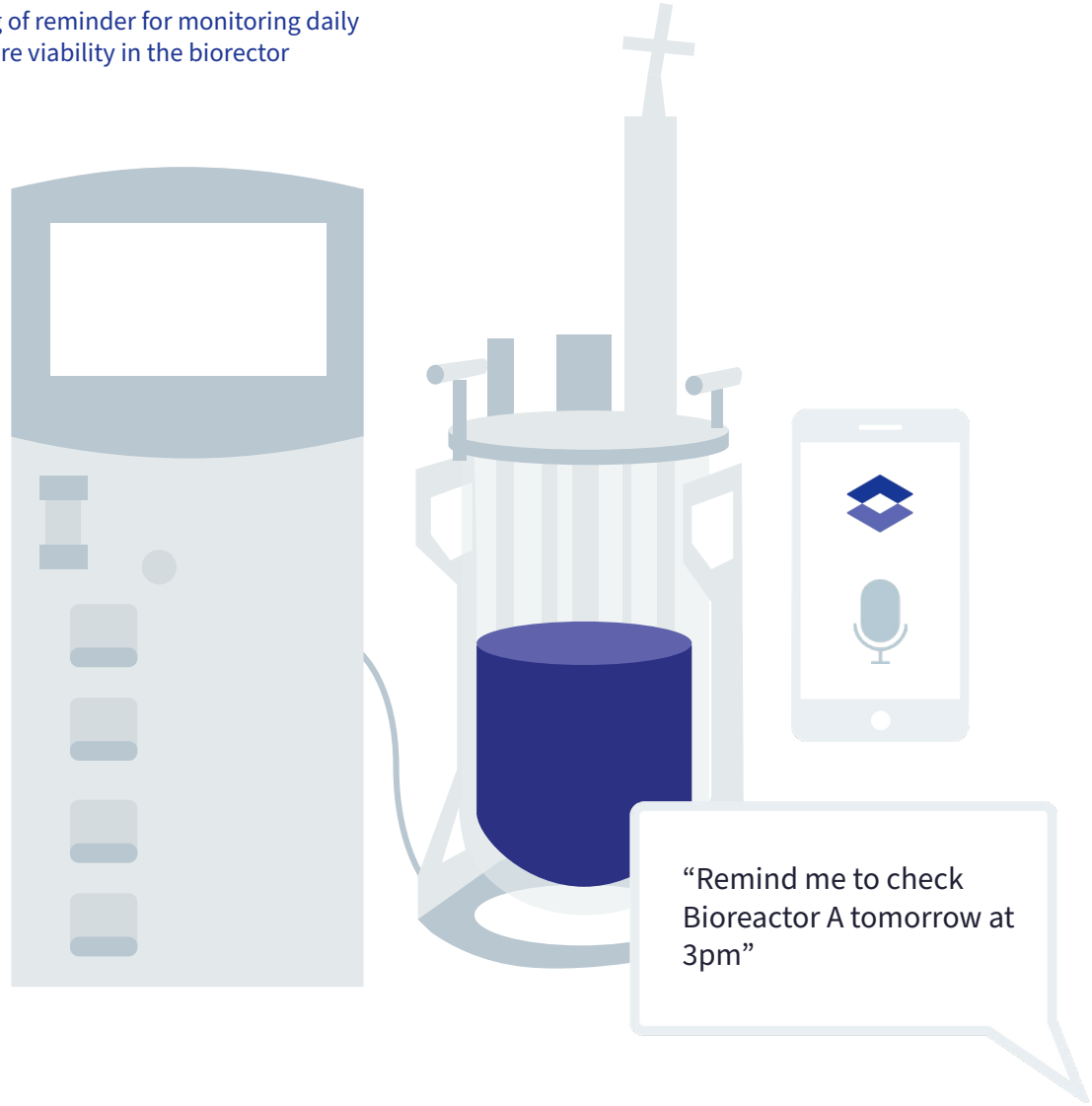
Fig.3: Hands-free sample position capture at the laminar flow

3. LARGE SCALE CULTURE FOR PROTEIN EXPRESSION

Once optimized, scientists then scale up a cell culture in order to produce a large amount of protein. Bioreactor tanks are the most common tool for large scale culture and provide multiple settings of various parameters, such as pH, temperature, osmolarity, oxygenation and stirring. These experimental condition data and metadata are very useful for troubleshooting. Moreover, cultures need to be monitored for several days, increasing the complexity of documentation.

With LabTwin, scientists can effortlessly record the multitude of details which need to be collected over days during a large-scale culture. In average, scientists record 34% more details with LabTwin than they were doing before. Moreover, LabTwin provides integrated reminders so scientists don't forget to check their ongoing cultures.

Fig.4: Setting of reminder for monitoring daily the cell culture viability in the biorector



4 & 5. PROTEIN EXTRACTION AND PURIFICATION

After several days of culture, scientists then isolate proteins from component cell parts. Several methods of protein extraction exist, from sonification to cell lysis, and each method should be tested and optimized to maximize recovery of intact proteins. Scientists usually document each sonification parameter (number, duration, burst frequency) in order to be able to repeat successful experiments, troubleshoot unsuccessful experiments and create protocols.

> "When I hand over my report to another person, the extra details are what help them to make the experiment a success."

LabTwin User
Scientist, Top 10 Pharma Company

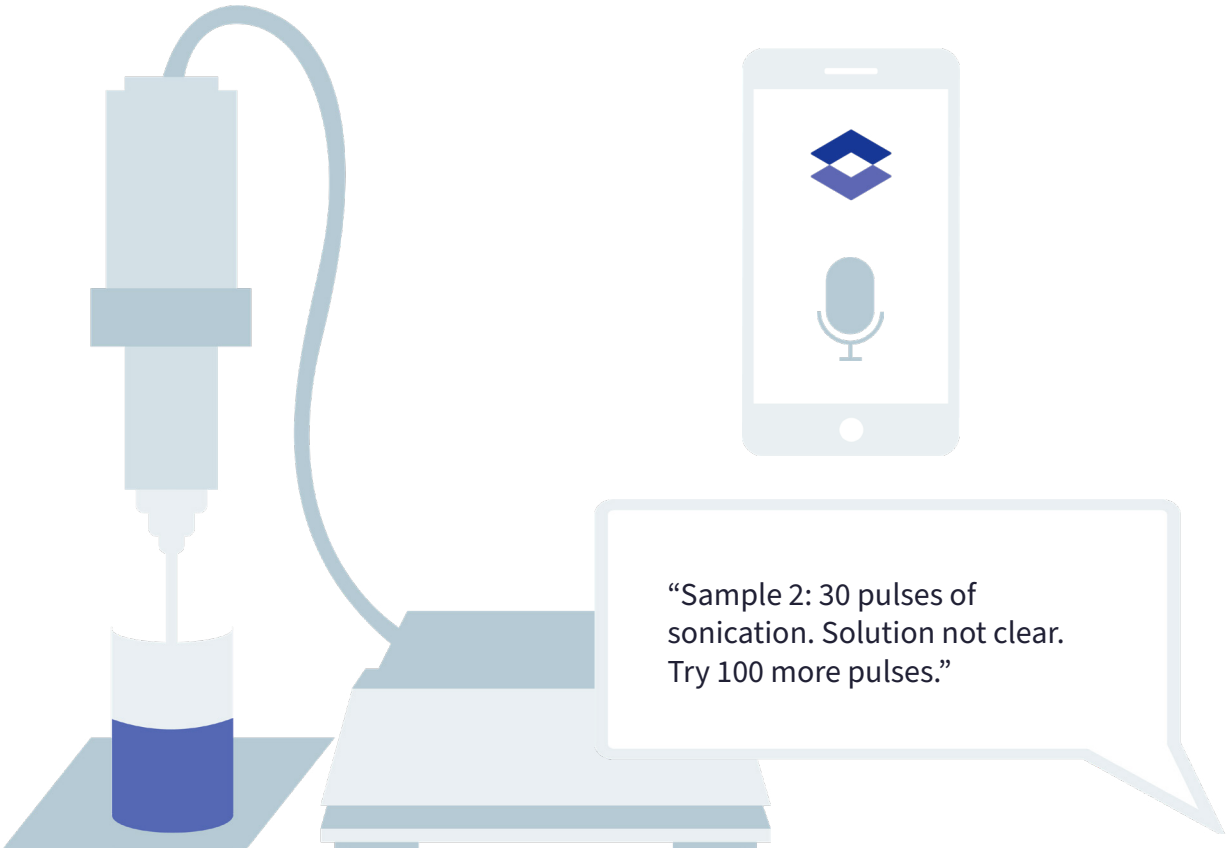


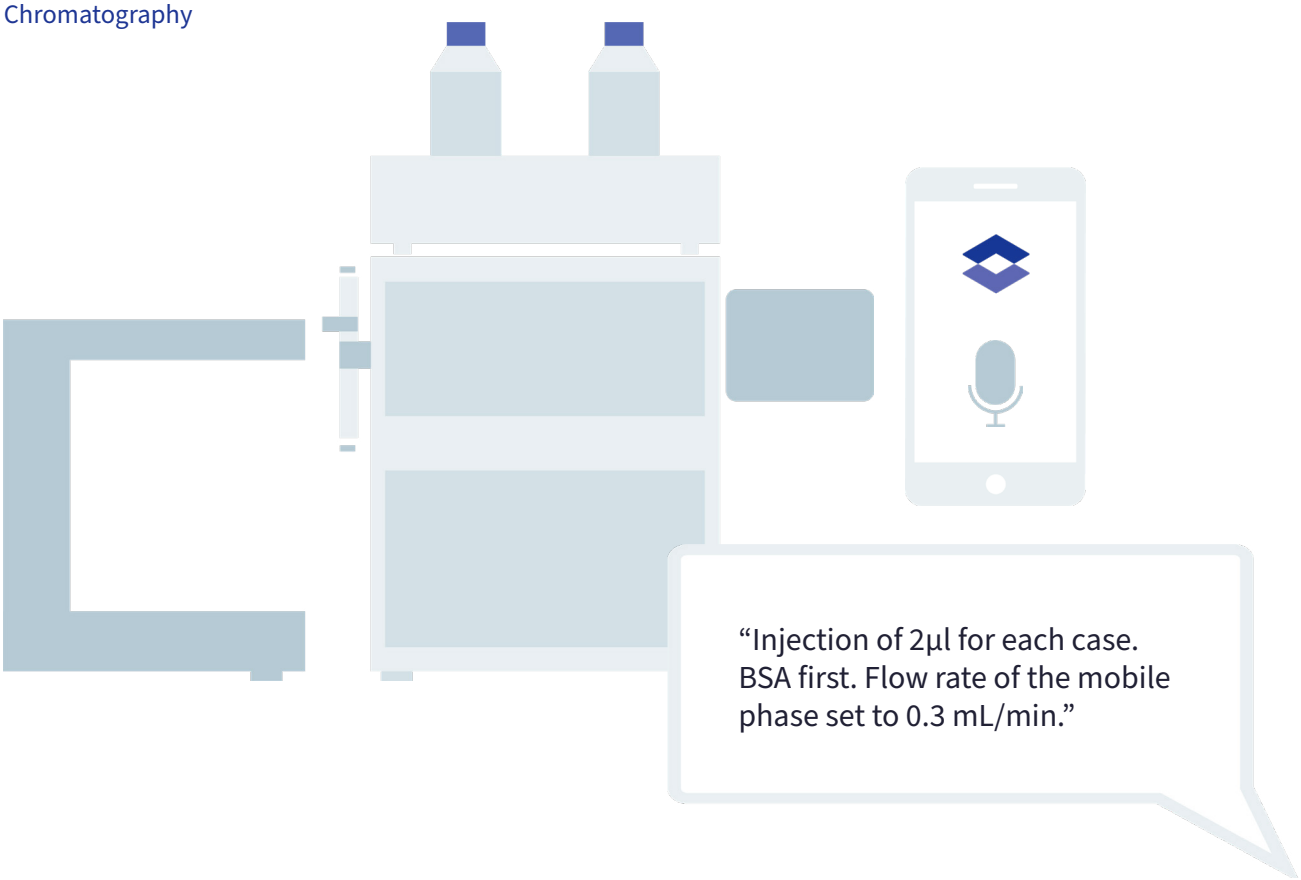
Fig.5: On the go capture of protocol deviation during cell lysis by sonification

The extracted proteins are then sorted by High-Performance Liquid Chromatography (HPLC) to isolate the protein of interest.

Scientists report being able to record more details about each experiment using LabTwin, compared with previous documentation methods, which in turn makes it easier to troubleshoot or reproduce experiments. 84% of the scientists declare that LabTwin improves troubleshooting.

With LabTwin, researchers can list the different parameters used and describe their results, simply by talking. The voice-powered digital lab assistant then automatically transcribes all voice notes into written text.

Fig.6: Recording of setting parameters for High-Performance Liquid Chromatography



6. QUALITY CONTROL

Once a protein is isolated, several tests are conducted to assess protein purity and integrity. The classic electrophoresis gel can check purity, while mass spectrometry analyzes integrity. Chromatography systems or spectrophotometers can also be used to check and quantify proteins. Collecting information from all these different devices, often in different formats (manual notes, screenshots, print-out), can take more than a day.

With LabTwin, all notes and pictures are automatically gathered in one place, saving scientists a significant amount of time, reducing data loss and enabling real-time data-driven decisions.

Moreover, scientists report particularly enjoying being able to set up multiple labelled timers within the LabTwin app. One scientist shared his satisfaction at not having to carry around and mix up five different kitchen timers to complete his experiments.

> "I have to make decisions very quickly depending on a particular outcome. Real-time recording and accessing information is a great help."
>
> **LabTwin User**
> Scientist, Top 10 Pharma Company

Fig.7: Taking pictures of electrophoresis gel or mass spectrometry results with corresponding comments

7. ANALYSIS AND REPORTING

Each workflow ends up with scientists analyzing results and preparing reports. To do this, scientists often need to collect notes from different sources, transcribe them from manual to digital format and then upload them to either store or share with colleagues.

With LabTwin, scientists can take voice notes at the bench and have these automatically transcribed while they work. Then when researchers finish their experiments, they can quickly source all relevant notes in the LabTwin Web Platform using the label they chose for a particular experiment.

Scientists report that using LabTwin helps them save time and energy, and produce better quality reports.

Fig.8: Creation of a report directly in LabTwin with the selected notes, pictures and results

CONCLUSION

Documentation is very important for method development as each experiment is unique and will need to be reproduced if successful. LabTwin's voice-powered digital lab assistant aids with method development by enabling scientists to record every parameter set as well as any deviation occurring throughout an experiment. This richer, real-time documentation facilitates troubleshooting and improves reproducibility. Ultimately, LabTwin saves scientists time by reducing the number of unsuccessful experiments.