

LabXchange

Summary by Danilo Faccenda PhD, Lecturer in Biochemistry, University of Hertfordshire

Introduction

LabXchange (<https://www.labxchange.org/teach>) is an interactive platform that offers teaching and learning resources for STEM teachers. It enables educators to gain ideas on how to structure their lectures, incorporate various types of activities into their teaching sessions, and create an engaging and inclusive learning environment to enthuse students into developing a career in science.

To promote the implementation of the ABE laboratory activities in the curriculum, several resources have been included in LabXchange. There are two clusters, 'Foundational Concepts and Techniques in Biotechnology' and 'Exploring Precision Medicine'. By selecting the desired cluster, you can view a series of resources that specifically accompany the ABE labs. Various pathways have been created to introduce and expand on ABE lab concepts and activities. Like all other LabXchange pathways, they comprise a mixed collection of teacher guides and learning activities that can supplement an in-person classroom or lab experience, from question banks to reading resources, videos and interactive platforms. All these resources are also browsable through our 'Library' (Subject area: 'Biological Science' → Subfield: 'Biotechnology' → Source: 'LabXchange' → 'Pathways'), or by typing ABE labs in the Search tool. For instance, if you are running a practical activity on bacterial transformation (ABE Lab 5), the respective pathway includes preparatory materials that can be used in advance, such as an introductory video explaining the technique or lab simulations through which students can virtually practice the techniques they will use in the lab, contributing to skills building.

If using LabXchange for the first time, it may be worth browsing through the content to become familiar with the wide range of teaching and learning activities available. In the menu bar at the top of the screen, you have the option to navigate through resources by subject area, or you can choose to access the full library and use advanced search options.

Getting started

To help you set up a LabXchange account, so that you can start using our resources and design your classes, there is a '[Get Started](#)' page. Here, you can watch an introductory video about the LabXchange platform and access a step-by-step guide on how to make the most out of the platform.

Subject area search

Once you have selected the subject area of interest (<https://www.labxchange.org/subjects>) you can then view all resources linked to that category, including 'Biology', 'Chemistry', 'Physics' and 'Earth & Space'. To facilitate browsing, under each subject area resources are arranged by education level, ranging from middle school to high school and advanced placement & college. Activities are further grouped by topic; for instance, an A-level Biology teacher who wants to develop their lesson on protein structure can easily access all resources available on the topic by selecting 'Biology' subject, 'High School' level and 'Biomolecules' topic. Another useful section included under each subject area is "Introduction to", giving access to a cluster of resources that provide foundational concepts in the selected subject area for students approaching these themes for the first time. These pathways can be used to give an overview of specific topics during introductory lessons, to summarise the main terms and concepts related to those topics, or to suggest areas to investigate further. For instance, if you are preparing a series of lessons on evolution, you can select the 'Evolution' pathway under 'Introduction to Biology'. You will access a list of resources, including texts, talks by experts explaining the importance of studying evolution, videos describing fun fact and current issues in the field, and simulations, that can be used to engage students with the topic and inspire them to study further. There are three levels of lab simulations to allow the gradual buildup of competencies and adaptation to the background knowledge and skills of the class.

Library search

Selecting 'Library' in the menu bar at the top of the screen (<https://www.labxchange.org/library>) allows you to apply various filters to refine your search and select specific resources. Resources can be searched by subject area, subfield and prerequisite knowledge, as well as duration, source and language. As an example, if you want to develop a lesson on protein structure for Advanced Placement Biology students, you simply need to select the 'Biochemistry' subfield under the 'Biology' subject area, 'Advanced' knowledge and 'Pathways', which will bring you to all the pathways available under this section, including 'Proteins'. You can restrict your search to specific resources, such as 'Videos', 'Audio', 'Questions', 'Simulations' or 'Case studies'. Some of the most used resources are videos, which can enrich any lesson by expanding on taught concepts, providing insightful perspectives from experts in the field, and linking the subject to contemporary issues, overall promoting student engagement. Laboratory simulations represent another powerful tool to foster the understanding of the subject through active learning and by facilitating the development of practical skills. The laboratory simulations offered can be used as a replacement for laboratory activities, or in preparation for upcoming practical classes. In both cases, students can practice their skills by gradually increasing the difficulty level of the various tasks, allowing for a more personalised learning experience. Finally, under the section 'Documents', various teaching resources supporting the development of interactive and engaging lessons are also available, such as lesson plans or topic guides.

Lesson planning

An example of how you can use LabXchange to plan your lesson is provided below. Imagine you want to create a lesson on photosynthesis for A-level biology students. There are reading lists, videos, topic simulations and homework. You can start by developing some asynchronous activities involving both reading tasks and videos. As an example, you can ask students to read an Overview of Photosynthesis developed by LabXchange partner OpenStax ([Overview of Photosynthesis](#)), prior to the first lesson. This would lead to a class discussion that can be supported by videos such as one developed by LabXchange partner Crash Course on the carbon cycle ([Global Carbon Cycle](#)), which further highlights the importance of photosynthesis for life on Earth. To explain more advanced concepts like the biochemistry of photosynthesis, you can make use of videos developed by Khan Academy on the reactions occurring in photosynthetic organisms, from an overview of the photosynthetic process ([Photosynthetic Process](#)) to light dependent-reactions ([Light-Dependent Reactions](#)) and the Calvin cycle ([Light-Independent Reactions](#)). These resources can be further supplemented by interactive activities, which you can find under 'Interactives' ([Photosynthesis Interactives](#)), simulations ([Photosynthesis Simulations](#)) or question sets ([Photosynthesis Question Sets](#)). By implementing all these activities into your lessons, you can offer a varied and inclusive learning experience, fostering student engagement with the taught topic both in class (through videos, simulations and interactives) and independently (through focused readings and homework templates).

Teacher resources

Another useful page is '[Teacher Resources](#)', which can be accessed from the 'Help' menu at the bottom of the page. In this section, you can access interactive learning and teaching resources focused on developing laboratory skills and inspiring future scientists. These resources, grouped by type, allow for easy navigation through the multitude of support available, and include laboratory simulations, experimental design simulations, and method videos, which help guide students through an understanding of fundamental concepts and techniques in science. There are questions sets to help assess understanding and knowledge retention, and narratives focused on sharing personal stories from STEM professionals. On the same page, you can access ready-to-use lesson plans, specifically designed to connect students with experimental design and lab activities. These useful resources can help you design engaging and inspiring activities. Considering the increasing demand for flexible and inclusive learning, there is also a section to support online teaching practice, including guidance on how to design engaging and interactive online lessons by using our resources, and foster asynchronous independent learning.