Electronic Lab Notebooks (ELNs)

This bulletin is one of a series of papers from ECAR working groups designed to help institutional leaders learn about and understand the implications of emerging technologies in higher education. These technologies have been identified as the “Top 10 Confusing Technologies” in the ECAR report *Higher Education’s Top 10 Strategic Technologies for 2015*. Other papers and related resources are available at the research hub for *Higher Education’s Top 10 Strategic Technologies for 2015*.

Electronic lab notebooks (ELNs) are simply that—electronic software that is intended to replace paper lab notebooks. Laboratory notebooks are used by scientists and other researchers to organize their data, including experiments, protocols, notes, and more. Lab notebooks have a history of being used for patent filings and defenses and serve as the “primary record of research.”¹ ELNs move the notebook into the digital world and, in doing so, offer additional benefits, including easier search, organization, and linking to content and data (i.e., an ELN may link directly to lab equipment or related databases). In addition, backing up and sharing data with other researchers (including in cases of collaborative work) are simplified with electronic notebooks. A number of ELNs are available today (including free “lite” versions and open-source options), and usage ranges from the very specific (e.g., for specific disciplines or “with specific applications, scientific instrumentation or data types”)² to more generalized, cross-disciplinary activities.³ Many ELNs are cloud based.

**Importance to Higher Education**

Higher education institutions that support researchers and science programs (e.g., biology, chemistry, medicine, engineering, etc.) will want to ensure that their students and staff have access to the tools necessary to do their work. ELNs may also help institutions meet regulatory compliance requirements. Understanding what products are available—and at what cost—will be essential as higher education labs move to ELN systems. This process includes understanding the various features of ELNs (e.g., date/time stamps, digital signatures, the ability to download data directly from lab devices, data export options, etc.) to determine which is the best fit. It also involves knowing what IT support might be required by the university to provide and maintain the software and support researchers as they move to an ELN format.

**Current Landscape**

ELNs have been in use in commercial industry for years and are starting to be used more broadly in universities and colleges.⁴ The benefits of providing an ELN service to your researchers is undeniable, including better security, shareability, and data management. In November 2014, Internet2 announced...
that it would be partnering with LabArchives to provide ELN services to members via NET+, which should speed higher education adoption.\textsuperscript{5}

Nonetheless, some potential hurdles stand in the way of broad adoption—in particular, domain specificity. Some are concerned that an institution-wide, centrally provided ELN service may not account for and answer the needs of unique domains (e.g., biology or chemistry). In the 2015 Top 10 Technologies Survey, when asked about ELNs, only 4% of respondents noted that ELNs are in place or being implemented or planned. However, an additional 21% are tracking it for potential future implementation (see figure 1), while 22% were unfamiliar with the technology.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Results of the 2015 Top 10 Strategic Technologies survey, when asked about electronic lab notebooks}
\end{figure}

\section*{When You Should Expect It}

ELNs are here now. Your researchers may already be using them. But implementation of a departmental or institutional ELN requires time and financial resources, and it may not be a service for all institutions, particularly those that don’t support a great deal of lab work. But for institutions where research in the sciences and other disciplines is an important part of the curriculum and mission, providing an ELN service is something to consider at this time.

\begin{tabular}{|c|c|c|}
\hline
When & Early Adopters & Mainstream \\
\hline
Now & ✓ & \\
1–2 years & & ✓ \\
2–3 years & & \\
3–5 years & & \\
More than 5 years & & \\
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\end{tabular}

\section*{Reviewer}

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\section*{Notes}

4. See, for instance, \textit{Learn About ELNs}, which describes the implementation of LabArchives at the University of Wisconsin–Madison. Cornell University also uses \textit{LabArchives}.
5. See Angela Stark, “\textit{LabArchives Partners with Internet2 to Bring Electronic Laboratory Notebook Services to Higher Education Institutions},” November 6, 2014.