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OPINION ARTICLE

REVISED eLabFTW as an Open Science tool to improve the quality and translation of preclinical research [version 3; peer review: 2 approved]

Michael Hewera [iD]1, Daniel Hänggi[1], Björn Gerlach [iD]2*, Ulf Dietrich Kahlert [iD]1,3*

[1]Clinic for Neurosurgery, Medical Faculty, Heinrich Heine University Dusseldorf, Düsseldorf, NRW, 40225, Germany
[2]PAASP GmbH, Heidelberg, BW, 69118, Germany
[3]Beijing Neurosurgical Institute, Beijing, China

* Equal contributors

Abstract

Reports of non-replicable research demand new methods of research data management. Electronic laboratory notebooks (ELNs) are suggested as tools to improve the documentation of research data and make them universally accessible. In a self-guided approach, we introduced the open-source ELN eLabFTW into our life-science lab group and, after using it for a while, think it is a useful tool to overcome hurdles in ELN introduction by providing a combination of properties making it suitable for small life-science labs, like ours. We set up our instance of eLabFTW, without any further programming needed. Our efforts to embrace open data approach by introducing an ELN fits well with other institutional organized ELN initiatives in academic research and our goals towards data quality management.

Keywords

Quality Management, Electronic Lab Notebook, ELN, Open Science, Reproducibility, Transparency

This article is included in the Research on Research, Policy & Culture gateway.

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	1	2
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version 1 16 Apr 2021	? view	

1. **Sam Parsons** [iD], University of Oxford, Oxford, UK

2. **Amiram Goldblum** [iD], The Hebrew University of Jerusalem, Jerusalem, Israel The Hebrew University of Israel, Shomre Hahar, Israel

Any reports and responses or comments on the article can be found at the end of the article.

Corresponding authors: Michael Hewera (michael.hewera@med.uni-duesseldorf.de), Ulf Dietrich Kahlert (Ulf.Kahlert@med.uni-duesseldorf.de)

Author roles: Hewera M: Conceptualization, Methodology, Project Administration, Resources, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Hänggi D**: Methodology, Resources, Writing – Review & Editing; **Gerlach B**: Conceptualization, Methodology, Writing – Review & Editing; **Kahlert UD**: Conceptualization, Methodology, Project Administration, Resources, Writing – Original Draft Preparation

> **REVISED** **Amendments from Version 1**
>
> The paragraph about pros and cons of ELNs was condensed and sorted. References to "prior publication" where specified. Parts of text where moved around and new headings and sub-headings have been introduced. The paragraph about other ELN manuals have been moved. The paragraph about why eLabFTW is useful for EQIPD as well, has been revised and the last paragraph was streamlined. Finally, some typos have been corrected and additional information about the search function has been introduced.
>
> **Any further responses from the reviewers can be found at the end of the article**

Introduction

In the light of reports of non-replicable research results, new ways to strengthen an open science approach for better transparency, reproducibility and traceability are needed.[1] Reproducibility meaning, that following the proper formatted documentation, any other lab group with the necessary equipment and personnel should be able to obtain the same results of any experiment performed.[2] An easy way to increase the legibility, tidiness, and overall quality of documentation, can be the introduction of an electronic laboratory notebook (ELN) in a research unit. Publishing the ELN entries in an unaltered state together with the manuscript enhances open science by creating transparency and will ultimately support reproducibility.[3] Here, ELNs will help in the context of research data management to make the entire life cycle of data transparent and achieve better integration to the documentation process.[4] The pros and cons of using ELNs have been discussed for a long time. The main fields of discussion are usability, accessibility, costs, time effort and data safety.[5,6] In our experience, the use of an ELN has many benefits towards traditional paper-based notebooks, but it is often a challenge to convince researchers of the advantages of using an ELN. We believe that the use of eLabFTW, and open source software, is a particularly good approach to overcome this hurdle and ensure high research data quality in small, preclinical research groups like ours.

eLabFTW is a lightweight general-purpose ELN. It consists of an Experiment and a Database section, whereas the Experiment section is designed to create and edit experimental documentation and link it to entries of the Database section. These can be set by the administrator to be any type of object (Chemicals, cell lines, equipment, etc.). These two sections are complemented by a Teams section, in which equipment can be booked in a scheduler and experiment templates can be shared. Finally, eLabFTW provides an extensive search tool.[7]

Disadvantages and advantages of ELN on experimental and lab management level

Overall acceptance for the usage of ELNs in the academic field is rather low. This seems to be due to perceived disadvantages, when using ELNs. These include the costs of obtaining the software and to maintain the necessary infrastructure, the time needed to implement the ELN and adapt the lab habits, as well as the fear of data being stored in a cloud on a foreign server.[6] Another important point concerns the protection of personal data (e.g., patient information) from unauthorized access when working with primary samples from patients.[6] Other scientists fear that the software will be discontinued at one point in the future, making it necessary to search for a new ELN, with the uncertainty whether the data from the previous system can still be accessed and imported to the new system.[6] Furthermore, there is a constraint to the implemented features of the software, in contrast to the possibility to freehand layouts, graphs and text in traditional lab notebooks.[8] These perceived disadvantages could be hurdles for people who want to introduce ELNs in lab groups. We believe that the advantages of ELNs outweigh the listed disadvantages by far. These advantages lay especially in the fields of open science and reproducibility, data safety, availability, findability, as well as transparency and standardization of procedures. Additionally, to those most important factors, there are other advantages in using ELNs: Digital recording of research data makes it much easier for researchers, to find their older data as well as data of others. In addition, the sharing of data is simplified, which makes discussing, cooperation and troubleshooting of experimental procedures much easier. ELNs contain time saving mechanisms, such as automatic import of data, the possibility of linking experiments and resources, and the usage of templates for standard experiments, which can additionally simplify the planning of experiments. Furthermore, most ELNs can also contribute to the simplification of lab management aspects as inventory management, sample tracking, communication, and digitalization of paperwork. Finally, in our experience data recording and documentation is done more carefully, when researchers have in mind, that their records are visible to others.[4]

eLabFTW has a combination of features making it a powerful tool to overcome hurdles
What is eLabFTW?

The open-source ELN eLabFTW (https://www.elabftw.net/) was developed to provide lab groups with a ELN that is free to use. The developers of eLabFTW being researchers themselves, provided a general purpose ELN with limited features, but a powerful database and search function. Making it easy to learn and use, yet very suitable for all kinds of research fields. It consists of an Experiment section, used for documenting experiments with a simple built in text editor and a Database section, which can be used to create entries for all kinds of items like plasmids, enzymes, primers, etc. by using

the same text editor. Furthermore, these items can be imported automatically via comma separated value (csv) files by the admin. Subsequently, these items can directly be referenced from the experiment section. Experiments themselves also can be linked to other experiments, making it easy to keep a seamless documentation of projects and experiments. eLabFTW is built according to the open data principle, providing open-source code, as well as providing on board functions to easily share experiment and database entries with people in- and outside of eLabFTW via direct links, or export to PDF or ZIP files.

In our opinion, eLabFTW is well suited to overcome the aforementioned hurdles of ELN implementation in small preclinical labs, as well as in other environments and lead to an improvement of research data transparency and findability.

eLabFTW is open-source software

Being an open-source software, there are no license or other costs to pay when acquiring eLabFTW. In addition, even if the development and support of the software is discontinued, the source code will always be available, preventing users to search for a new software solution. eLabFTW does not use any proprietary parts of code, so this property applies to the whole code of eLabFTW. Some other ELNs are open source but depend on pieces of proprietary third-party code. In addition, when needed, the code of eLabFTW can be adapted to individual needs, by trained IT-Staff in the organization.

eLabFTW is easy to set up

Providing the option to use Docker Containers, a kind of virtual machine, which contains all the necessary software to run eLabFTW. Even a person with only intermediate IT knowledge, when following the official documentation[9] can install eLabFTW. The initial setup takes less than 30 minutes, on a Windows computer, as tested by us. The setup works on a server or even a simple computer running Linux, Windows or MacOS. That ability for local installation makes eLabFTW suitable for critical data and enables data storages independently from the availability of cloud services offered by other ELN companies. This ensures high data safety, as it prevents access to data from outsiders and protects from using services with uncompliant privacy policies. Backup of data can be set up using a simple script[9] and the backup files can be stored on a second hard drive, or on other machines, like a Network Associated Storage to enhance data safety.

eLabFTW contains powerful tools for a safe documentation

eLabFTW offers a full text search engine, meaning it searches for all elements of the database, as well as in the written text of entries, making it easy to find older research data from yourself, and others. Additionally, eLabFTW contains a powerful search tool, which allow users to search for entries with specific properties. Search queries can be separated by space, and it can be selected if a space should mean an "and" or an "or" operator. All entries in the experiment section of eLabFTW can be timestamped after RFC 3161 standard, allowing for full audit trail documentation. In addition, all revisions in any entry are tracked, so that it can be proved that no data were altered. Every item in eLabFTW is identified by a unique identifier (eLabID), which is independent from the given title. Hence, all objects can be unambiguously identified. Finally, all entries in eLabFTW can be shared via a unique link with people inside or outside the lab group, if eLabFTW is running on a computer with internet connection.

The features mentioned above are the most outstanding differences between eLabFTW and a traditional paper-based lab notebook, or other ELNs. However, eLabFTW provides some more useful features, which can be beneficial for a lab. Firstly, it offers a simple interface with just a text editor and some additional features like file upload and the integration of image files into the text. Furthermore, items in eLabFTW are marked by tags, instead of being ordered in a folder structure, and can be exported to different formats (pdf, zip, json) to be shared or stored externally. The visibility for each item can be restricted to oneself, a specific group of people or set to public. This might be an important feature to secure rights of research. Lastly, eLabFTW provides an application programming interface (API) that can be accessed with a specifically created python library. This is useful, for example, for automatic upload of raw data to eLabFTW.

Implementation of eLabFTW in our lab
Finding the right ELN

The implementation of an ELN was supposed to be the first step of a bigger project of introducing a lightweight quality management system (QMS) in our lab.[10] An ELN was supposed to form the backbone of this QMS. For finding suitable software, we tested different trial versions of commercially and freely available ELNs. Our focus was on the usability rather than on the features, as we wanted to make transition to electronic documentation as easy as possible and many features offered by more expensive ELNs are not needed by our group. After initial testing, two commercial ELNs and eLabFTW came into closer selection. We got the notice that two ELNs in this selection are already hosted by our university, this being Labfolder and eLabFTW. After a two-week period during which both electronic lab books were tested in a small group, we decided to introduce eLabFTW to the whole lab. Although Labfolder has some features that

eLabFTW does not have (support of including Excel and Word files, adaptable page layout), we decided to implement eLabFTW because of the much quicker loading times, open-source format and in our opinion a much easier usability. After introducing eLabFTW to every lab member, we decided about the most useful setup for our lab environment, to make it suitable for our QMS.

Importing existing data

Before the setup of eLabFTW, we already started to introduce Standard Operating Procedures (SOPs) for our basic lab experiments. Using the database of eLabFTW proved to be a good way to distribute new versions of SOPs to every lab member effectively. As a first step, all existing SOPs were transferred into eLabFTW. The first new SOP described how to use eLabFTW and describes the form of documenting and time stamping of experiments, as well as linking database items. Secondly, we imported our complete database of vectors, primers, antibodies, enzymes, chemicals, consumables, and equipment, as well as cell lines into eLabFTW, together with the matching documentation as there are vector maps, material safety datasheets, primer sequences and melting temperature, antibody datasheets, restriction sites of restriction enzymes, cell line properties, handbooks of machinery, and so on. We also use the database to create project items, that all experiments belonging to that project can be linked to, to establish a timeline of experiments performed in that project. This was done using the import via csv files.

Creating groups, templates, projects, and tags

We created groups of users working on specific projects, so researchers can limit the visibility of entries to the only stakeholders of that project. Some Users where put in just the general group, and some in multiple groups, depending on their projects. Templates were created for the most common experiments, performed in our lab, so researchers need less time in documenting these experiments. Also, we introduced Tags for specific experiments and Projects. Partly these are also saved in the templates of specific experiments. Tagging experiments with specific Tags works in our experience much better than saving files in specific folders, because entries can be sorted with multiple tags, in contrast to just be in one single folder. We also use the database to create project items, that all experiments belonging to that project can be linked to, to establish a timeline of experiments performed in that project. After the setup, we started using eLabFTW to upload meeting minutes and documentation of other events.
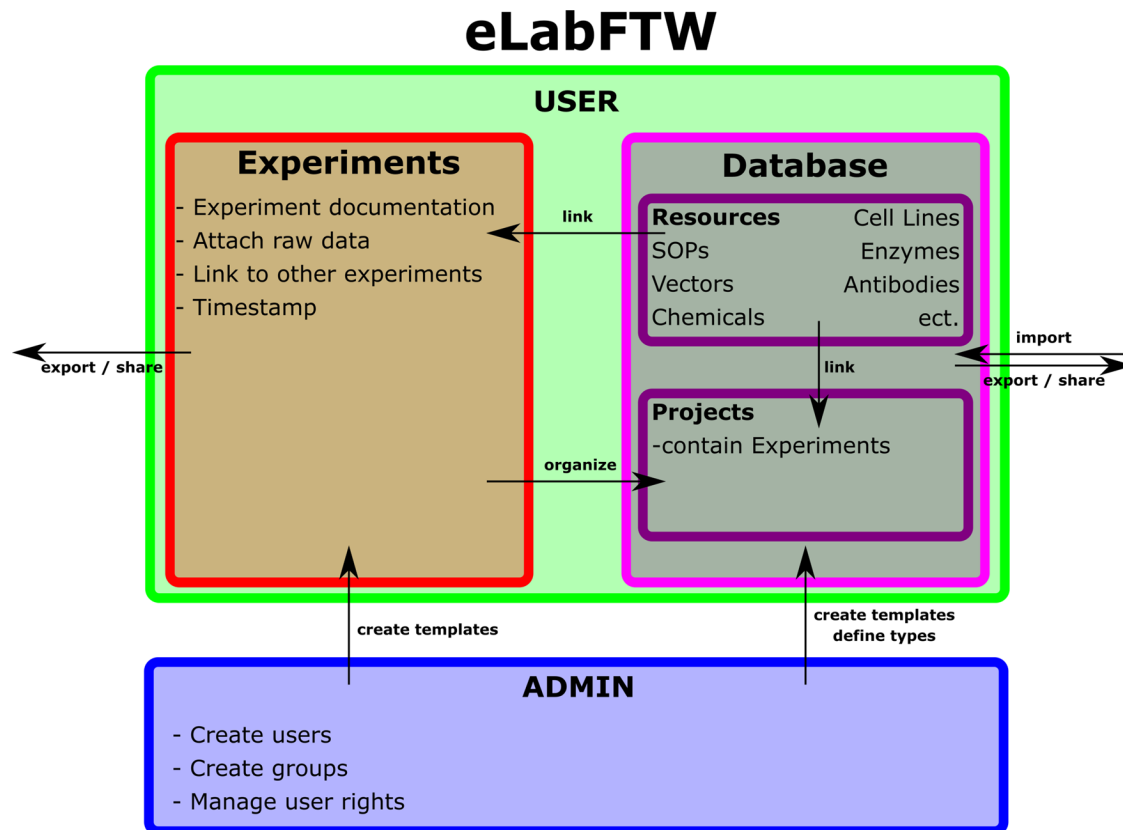

Figure 1. Configuration of eLabFTW as being used by our workgroup.

Unused features and changes

In our lab, we do not use the booking function of lab equipment, after we found it too inconvenient after a short test period. The ELN was also supposed to be used for one-on-one project communication in form of interactive weekly progress reports, as part of our planned lightweight QMS.[10]

This approach was ineffective, as it consumed too much time, led to misunderstandings and was unsuitable for the discussion of some specific problems. Consequently, we switched back to personal, verbal meetings for project planning. In our experience, ELN-reporting is only suitable for one directional communication. Still this possibility of one-directional way of communication showed an unexpected advantage during the still ongoing COVID-19 pandemic. Due to electronic recording of research results and protocols, less face-to-face communication was necessary, which helped to keep the infection risk on a low level.

Other projects dealing with ELNs

Next to our report, which focused on eLabFTW, there are also more general ELN guides from the Harvard Medical School Information Technology department 13 and the BIH14, as well as the ELN guide of the ZB Med.[4] Furthermore, there is the report of a research group using Evernote as their ELN.[8]

Trend of introducing ELNs

Our effort embeds well in current initiatives from leading biomedical institutions, as the RE-PLACE Project at the Berlin Institute of Health (BIH),[11] which is an institution-wide program for adopting ELN software at the Charité and BIH, by providing free licenses to the ELN Labfolder, as well as introductory courses and support. This project is combined with an evaluation study to understand if ELN usage is indeed beneficial for fulfilling needs of researchers and to improve the quality and transparency of research documentation and data management.

The efforts of setting up eLabFTW also fit with another project our lab is involved in, the EQIPD quality system (QS).[12] This is the first quality system for preclinical research and eLabFTW supports our efforts for external recognition of our quality procedures and towards an EQIPD certification. Implementation of the ELN supports the implementation and maintenance of several Core Requirements (CR) set forth by the EQIPD QS. The quality system is built on 18 CR (CR1 –CR18) and eLabFTW supports the lab already with six. For example, CR12 asks that "Protocols for experimental methods must be available", which is easily achieved with the ELN. In the same line, the CR on data records (CR6), data security (CR7), transparency (CR8) and reporting (CR9) can be easily fulfilled with such an ELN. Hence, an ELN should be considered as one of the pillars towards quality processes in a small research lab, especially when it integrates seamless in the daily lab routine as eLabFTW does.

In a forthcoming visionary standpoint, we think that stringent ELN implementation in more working units is facilitating the reduction of hurdles for interaction across disciplines, such as the interaction of basic scientists and patient-treating clinical faculty. We hypothesize this due to the fact that data can be rapidly and remotely available at any given time, not restricted to often incompatible time schedule of the participating stakeholders. Moreover, a growing body of large datasets will be summarized and presented in a more comprehensive and convenient way as compared to local storage solutions on core faculty servers or hidden folders in a given server infrastructure. Thereby, further exchanging interaction to data scientists and wet lab scientists is possible. Laboratory automation, as a standard for many work processes in industry and routine diagnostic labs[15] such as in our lab occurred for a liquid handling robotics.[16] Direct linking of ELN to machine output, without human operator data handling step in between, saving the data file in a time stamped and logged version will minimize error introduction in parallel to increase transparency of the project.

In the future, ELNs could form the backbone of many workgroups, even small ones, to simplify research in an environment that is being more and more digitalized. This assumes that more workgroups dare to make the step to switch from traditional, paper based documentation to digital solutions. Using a software as easy to set up as eLabFTW, we think that this switch will be easy and only need small adaptations in workflow to fully use all the benefits of electronic documentation.

Data availability

No data is associated with this article.

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Open Peer Review

Current Peer Review Status: ✅ ✅

Version 2

Reviewer Report 29 July 2021

✅ **Amiram Goldblum** (iD)

[1] Molecular Modeling Laboratory, Institute for Drug Research, The Hebrew University of Jerusalem, Jerusalem, Israel
[2] Fraunhofer Project Center for Drug discovery and Delivery, The Hebrew University of Israel, Shomre Hahar, Israel
[3] Molecular Modeling Laboratory, Institute for Drug Research, The Hebrew University of Jerusalem, Jerusalem, Israel
[4] Fraunhofer Project Center for Drug discovery and Delivery, The Hebrew University of Israel, Shomre Hahar, Israel

This article presents an electronic lab note book that is intended to surpass current ELNs in several aspects that are required to overcome or to balance the well-known disadvantages of current ELNs. Those disadvantages are very well presented after the introduction paragraph. Although eLabFTW presents and focuses in this paper on experimental preclinical or partially clinical labs, I believe that it could also be easily adapted and serve a theoretical and computational focused lab such as my own.

I have a few questions-suggestions regarding **major aspects** of this paper and a few minor issues :and typos. However, I am not suggesting any revision and my comments are only for the authors to consider:
1. There seems to be a gap between the attention and interest of eLABFTW for protecting personal data versus the need to stimulate replicability of results. Internal replicability is important and seems to be a cornerstone of eLabFTW, but a major issue is replicability by other labs., and that requires communication with the "outside world".

2. The issue of communicating to the world is not specified as a component of eLabFTW: Would it support easier reporting in the form of manuscripts, posters, talks, presentations? Would it help in writing the more diverse "methods" and "results" sections in MS?

3. Do the search options enable advanced boolean searches?

4. Up to what size of lab would the authors suggest to use eLabFTW?

Minor issues: Please explain all acronyms - first-what is **FTW**?...QM (Quantum Mechanics in my world...) and QMS, RFC 3161, CR etc...each unexplained acronym reduces the reader's attention.

Typos:
- First line in "What is eLabFTW on page 3: "with a free **(ability?)** to use ELN.

- Line 3 in "Creating groups, templates etc." (page 50 should be **Templates were created)**

- Line 1 second parag under "unused features and changes" (page 6) "it consumed too much time, **led** to misunderstandings... (led is the past of lead...).

- Line 3 under "Other projects dealing with ELNs (page 6) - the last sentence "Trend of introducing ELNs" should be erased, it was probably confused with the next paragraph title.

Is the topic of the opinion article discussed accurately in the context of the current literature?
Yes

Are all factual statements correct and adequately supported by citations?
Yes

Are arguments sufficiently supported by evidence from the published literature?
Yes

Are the conclusions drawn balanced and justified on the basis of the presented arguments?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I lead a computational lab that focuses on molecular modeling and drug discovery and design.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 29 Jul 2021
Michael Hewera

Dear Amiram Goldblum,

I thank you a lot for reviewing our publication.

You will be happy to see, that we corrected the typos, that you pointed out, and added explanations to the abbreviations.

The question of boolean search operators was answered as well.

The method of sharing data with the outside world, is already explained in the old version: "as well as providing on board functions to easily share experiment and database entries with people in- and outside of eLabFTW via direct links, or export to PDF or ZIP files".

Thanks a lot and best regards,
Michael Hewera

Competing Interests: No competing interests were disclosed.

Reviewer Report 14 June 2021

https://doi.org/10.5256/f1000research.56841.r86284

Sam Parsons
¹ Department of Experimental Psychology, University of Oxford, Oxford, UK
² Department of Experimental Psychology, University of Oxford, Oxford, UK

The revisions to the manuscript have strengthened the clarity of presentation, and streamlined the reading. It is much clearer what messages readers should take away. The restructuring is something in particular that makes this a stronger manuscript. I have a few very minor suggestions that I think would improve the manuscript.

1. In the abstract, "self-guided approach". I may be misunderstanding – I interpret this as indicating that the manuscript will be a guide for me as a reader to implement eLabFTW. But, the paper reads as reflecting on the authors experience. Likely only a minor issue, as "In a self-guided approach" could be removed from this sentence.

2. In the first paragraph, I am unsure if replication is intended to indicate using the same data as the original paper or running the same study to collect new data with the same procedures. Reproducibility has been described as both, so it would be nice to specify.

3. A very minor point on the introduction section – I think an explicit sentence stating that this manuscript focuses on eLabFTW could streamline this section a little more.

4. Very minor – in the "eLabFTW is easy to set up" subsection: the opening sentence feels out of place and may be missing something, perhaps it belongs later in the paragraph? I was not sure if the docker aspect was part of the set up or a powerful extra.

5. A few words on the RFC 3161 standard, and why this is of benefit, would be a useful

addition.

6. The QMS abbreviation is not explained, could this be laid out fully or the full title used instead?

7. A citation or website for the Labfolder software should probably be included.

8. It may be useful to also reflect on the limitations or stumbling blocks the authors found with eLabFTW. This is somewhat indicated by the 'unused features and changes' section, but I wonder if there are useful thoughts the authors might share on this too.

Is the topic of the opinion article discussed accurately in the context of the current literature?

Yes

Are all factual statements correct and adequately supported by citations?

Yes

Are arguments sufficiently supported by evidence from the published literature?

Yes

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Openness and reproducibility, cognitive affective, psychometrics.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

- -

Version 1

Reviewer Report 06 May 2021

https://doi.org/10.5256/f1000research.55395.r84047

? **Sam Parsons** (iD)
  [1] Department of Experimental Psychology, University of Oxford, Oxford, UK
  [2] Department of Experimental Psychology, University of Oxford, Oxford, UK

3 Department of Experimental Psychology, University of Oxford, Oxford, UK

The manuscript describes the open-source electronic lab notebook eLabFTW and the authors experience with implementing this into their workflow. I see this as a potentially useful contribution to the literature, in part because I am broadly positive about the use of ELNs. The majority of my comments are based around improving the clarity of the manuscript – I have numbered suggestions for ease.

1. The main point (which ties in to many of the below suggestions for clarity) I am not clear on after reading the manuscript, is the framing or the take-home message I should be left with. The content included is informative, but moves between; support or advocacy for the eLabFTW program, reflections on the groups experiences implementing it, and reflections on the good work for open science the authors groups and institutions are doing. Throughout, it feels that these aims are merged together, which makes the flow of the paper difficult to follow. I have several general suggestions that could help improve this clarity:
    1. Consider more subheadings to distinguish the message of each subsection. At a minimum, I think it would be valuable to separate or clearly distinguish sections. e.g. descriptions of eLabFTW's technical details and instructions from the authors reflections on implementing eLabFTW. Greater use of subheadings would help the flow of the manuscript and reader clarity.
    2. Given that the abstract describes the paper as providing a self-guided approach to using eLabFTW, this section could benefit from more detail. Reading the abstract, I thought (though this may be just my reading) that this would be the core element of the paper but this section was quickly moved into more general comments on other initiatives. Further detail, and examples such as the groups own ELN, would make this a much more useful contribution.
    3. Consider removing some references to work specific to the authors groups/institutions – or, revise so that it can be made relevant to the readers context in using ELNs. For example, as a reader I did not find the closing sentence to be useful to my understanding of the eLabFTW tool "Those aspects are only a few cornerstones that shall be a focus of operations developments of a state-of-the-art translational research lab, currently underway in the lab of neurosurgery at the University Clinic Düsseldorf". The sentences describing the good work towards openness will be maximally useful to the reader if they are situated within how they can implement these tools themselves, otherwise they are not necessary to the manuscript and distract from the main content.
2. The manuscript mentions 'As described in one of our previous publications' several times. My original suggestion was that more description of what was discussed would be valuable in this manuscript, else the reader is missing potentially vital information to this context. Having now read the cited paper, I am less clear of the purpose of the "Implementation of eLabFTW in our lab" section of this manuscript, which in turn leaves me less clear of the purposes of this manuscript, which related to my first point also. Perhaps the authors can more clearly differentiate between the contribution both papers make and what this manuscript adds in particular?

The following comments relate to more specific sections of the manuscript.

1. In the opening paragraph, it may be useful to differentiate between the authors definition of reproducibility and replicability. Later in the paragraph focus is placed mainly on data management, so I thought that computational reproducibility was the focus (same data +

same analyses = same results) whereas the definition used was what others might describe as replicability (new data with the same procedures = same results). Not that I have a problem with the definition used, but the clarity for the focus or benefits of ELNs could be improved with this.

2. Minor typo: "unaltered toegether" I think that a word might also be missing here, perhaps 'in an unaltered format together with…' ?

3. "The pros and cons of using ELNs have been discussed for a long time" – Perhaps tie this in to the following two sections, or provide citations here?

4. I suggest moving around some of the text in the advantages and hurdles sections – it was slightly confusing to read as the advantages section first highlighted disadvantages and the hurdles also starts with an entire paragraph on the benefits. As mentioned above, citing examples that highlight the benefits would be valuable here too.

5. Perhaps the authors could be clearer about the focus on life sciences. Given that this is the context the ELN was implemented in, it makes sense. But, it might be useful to highlight or discuss further the use of ELNs in other contexts, or state that this paper focuses on the life sciences solely.

6. I suggest splitting the long paragraph discussing the open-source aspect of eLabFTW at least into a paragraph on open-source and a paragraph on the set up (further use of subheadings would assist here too).

7. I suggest removing the SOP acronym as it is not needed.

8. I was not sure of the purpose of the paragraph on EQIPD, it did not feel relevant to the ELN discussion.

9. Perhaps the paragraph on other guides for ELNs could be integrated to somewhere else in the manuscript?

In the interest of openness I always sign my reviews,
Sam Parsons

Is the topic of the opinion article discussed accurately in the context of the current literature?
Yes

Are all factual statements correct and adequately supported by citations?
Partly

Are arguments sufficiently supported by evidence from the published literature?
Yes

Are the conclusions drawn balanced and justified on the basis of the presented arguments?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Openness and reproducibility, cognitive affective, psychometrics.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 12 May 2021
Michael Hewera

Dear Dr. Parsons,

I (in the name of my co-authors, as well) thank you for reviewing our publication and for your valuable feedback.
We tried to implemented most of your suggestions in the new version of our publication.

These are (not only)
- Condensing the part about pros and cons of ELNs and sortig it
- Specifying references to "prior publication"
- moving text, and creating new headings/sub-headings
- Better explain the context of eLabFTW and EQIPD
- Streamline the last chapter

Best regards,
Michael Hewera

Competing Interests: No competing interests were disclosed.

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