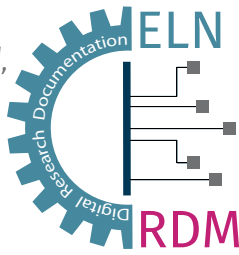# RE-PLACE | LESSONS LEARNED FROM ELN TRAINING INTERVENTIONS

In the context of the replication crisis, the use of an **Electronic Laboratory Notebook (ELN)** is considered an effective measure to strengthen *Open Science and Responsible Research & Innovation* through the integration of **Digital Research Documentation (DRD)** into **Research Data Management (RDM)** facilitating research transparency, co-production and transfer of knowledge [1]. Hence, BIH QUEST Center for Responsible Research started an organisation-wide ELN implementation programme at Charité – Universitätsmedizin Berlin, one of the largest university hospitals in Europe, offering ELN software licences, training and support. In the scope of the BMBF-funded evaluation study RE-PLACE [2], which is embedded in QUEST's comprehensive *Monitoring & Evaluation System COMPASS*, the process of this large-scale institutional ELN implementation is currently being evaluated.

Evaluation results indicate that researchers at Charité, in principle, share the organisational goals intended with ELN implementation. However, a substantial dropout rate of ELN users also shows that research teams face multiple challenges in the implementation process that reach beyond a lack of software skills. Further development and improvement of current research documentation practices would require research teams to achieve a shared understanding of DRD and RDM. Also, they would have to agree upon open and responsible DRD criteria and adapt (laboratory) routines to integrate ELN in RDM effectively. Thus, evaluation findings so far point to the social innovation character of DRD and the need for research organisations and implementation programme developers to create awareness for this social aspect of ELN implementation at all organisational levels at Charité [3].

Christiane Wetzel[1*], Ina Frenzel[1], Daniela Schirmer[2], Sarah Wendt[1], Philipp Pohlenz[2]

[1] BIH QUEST Center, Charité – Universitätsmedizin Berlin, Germany;
[2]Otto-von-Guericke-Universität Magdeburg, Germany
*corresponding author

## OBJECTIVE

Identification of factors influencing ELN implementation at Charité

Evaluation of benefits and value of ELN implementation at Charité

## APPROACH & METHODS

Programme theory-driven impact-oriented, participatory evaluation design [4]

Mixed Methods [5], and Multimethod reseach [6] designs

**2021 Evaluation cycle**
39 ELN teams randomly assigned to 3 study groups (SG) received different extent of QUEST ELN support: SG1 = ELN licence, SG2 = ELN licence + group training, SG3 = ELN licence + group training + tutorials.

## DELIVERABLES
### FOR INFORMED DECISION MAKING

Output maps on QUEST ELN activities

Evaluation reports & recommendations for ELN programme development

RE-PLACE indicator system

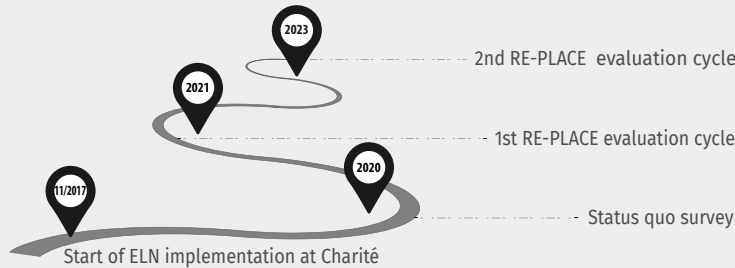Questionnaire(s) measuring DRD quality and its institutionalisation

## LITERATURE

[1] Gerlach, B. et al. (2019) doi.org/10.1007/164_2019_287
[2] Wetzel, C. et al. (2020) doi.org/10.36197/DUZOPEN.021
[3] Wetzel, C. et al. (2022) doi.org/10.14512/tatup.31.1.35
[4] Bryson, J.M. et al. (2010) doi.org/10.1016/j.evalprogplan.2010.07.001
[5] Tashakkori, A. & Teddlie, C. (2010) doi.org/10.4135/9781506335193
[6] Goertz, G. (2018) doi.org/10.1515/srsr-2018-0081
[7] Sandager, D. et al. (2019) doi.org/10.1080/14767333.2019.1611039

## FUNDING

## 1) EVALUATION – TIMELINE & INDICATORS



2023 — 2nd RE-PLACE evaluation cycle
2021 — 1st RE-PLACE evaluation cycle
2020
11/2017 — Status quo survey
Start of ELN implementation at Charité

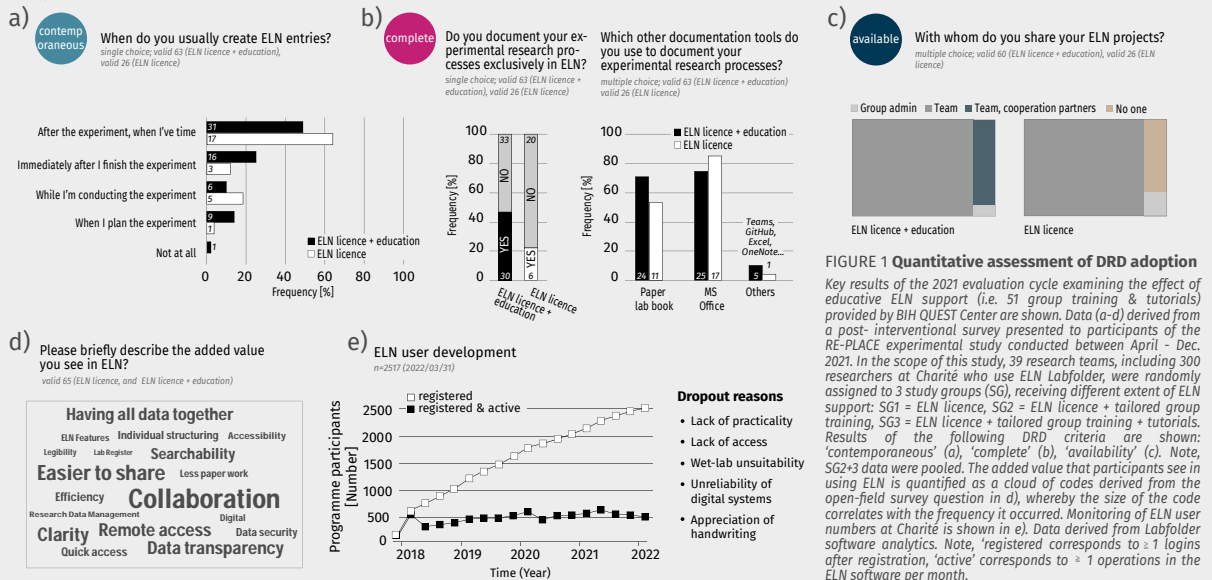| Strategy | Policy | Governance | | Sustain ability |
| Knowledge transfer | Verifiability | | Provenance | Accessibility |
| QUEST ELN services | | Reach of target group | Gain of knowledge | Attitudes |

## 2) OPEN & RESPONSIBLE DIGITAL RESEARCH DOCUMENTATION

...is the verifiable description of entire research processes and data accessible for knowledge co-production, review and data re-use.

attributable · legible · contemporaneous · original · accurate · complete · consistent · enduring · available

ALCOA+ standard used by WHO, FDA and others to ensure data integrity, adapted to DRD

## 3) EVALUATION RESULTS – 2021 EVALUATION CYCLE

a) **contemporaneous** When do you usually create ELN entries?
single choice; valid 63 (ELN licence + education), valid 26 (ELN licence)



After the experiment, when I've time — 31 / 17
Immediately after I finish the experiment — 16 / 3
While I'm conducting the experiment — 6 / 5
When I plan the experiment — 9 / 1
Not at all — 1

ELN licence + education / ELN licence

b) **complete** Do you document your experimental research processes exclusively in ELN?
single choice; valid 63 (ELN licence + education), valid 26 (ELN licence)



Which other documentation tools do you use to document your experimental research processes?
multiple choice; valid 63 (ELN licence + education) valid 26 (ELN licence)



ELN licence + education / ELN licence
Paper lab book — 26 / 17
MS Office — 25 / 17
Others — 5
*Teams, GitHub, Excel, OneNote...*

c) **available** With whom do you share your ELN projects?
multiple choice; valid 60 (ELN licence + education), valid 26 (ELN licence)



Group admin · Team · Team, cooperation partners · No one
ELN licence + education / ELN licence

**FIGURE 1 Quantitative assessment of DRD adoption**
Key results of the 2021 evaluation cycle examining the effect of educative ELN support (i.e. 51 group training & tutorials) provided by BIH QUEST Center are shown. Data (a-d) derived from a post- interventional survey presented to participants of the RE-PLACE experimental study conducted between April - Dec. 2021. In the scope of this study, 39 research teams, including 300 researchers at Charité who use ELN Labfolder, were randomly assigned to 3 study groups (SG), receiving different extent of ELN support: SG1 = ELN licence, SG2 = ELN licence + tailored group training, SG3 = ELN licence + tailored group training + tutorials. Results of the following DRD criteria are shown: 'contemporaneous' (a), 'complete' (b), 'availability' (c). Note, SG2+3 data were pooled. The added value that participants see in using ELN is quantified as a cloud of codes derived from the open-field survey question in d), whereby the size of the code correlates with the frequency it occurred. Monitoring of ELN user numbers at Charité is shown in e). Data derived from Labfolder software analytics. Note, 'registered corresponds to ≥ 1 logins after registration, 'active' corresponds to ≥ 1 operations in the ELN software per month.

d) Please briefly describe the added value you see in ELN?
valid 65 (ELN licence, and ELN licence + education)



Having all data together
ELN Features · Individual structuring · Accessibility
Legibility · Lab Register · Searchability
Easier to share · Less paper work
Efficiency · Collaboration
Research Data Management · Digital
Clarity · Remote access · Data security
Quick access · Data transparency

e) ELN user development
n=2517 (2022/03/31)



registered · registered & active

**Dropout reasons**
- Lack of practicality
- Lack of access
- Wet-lab unsuitability
- Unreliability of digital systems
- Appreciation of handwriting

## Identification of key themes influencing ELN adoption at Charité

Key themes derived from qualitative data collected in eight interviews, ten indirect training observations, 51 training protocols and one workshop with ELN group administrators conducted in the scope of the RE-PLACE experimental research study between April 2021 and May 2022

For establishing an ELN-based digital research documentation practice in line with the OS & RRI goals at Charité, the **ability** of research teams to develop a **shared understanding** of digital documentation criteria and procedures has emerged as an influential factor that depends on ELN software **skills** at the level of individual researchers, and RDM **knowledge** at the level of research teams. Furthermore, the **availability of resources,** e.g. time, is an influencing factor that relates to **leadership** as research group leaders or principal investigators can actively support open and responsible documentation practice in research teams. Moreover, ELN adoption seems to be tied to **IT infrastructure** at Charité.

## 4) RECOMMENDATIONS
### FOR PROGRAMME TAILORING & DEVELOPMENT

Creating educative synergies, in particular between QUEST Center's ELN and OD/RDM programmes

Focus on research groups (instead of individual researchers) as the preferential target group

Providing a comprehensive, group-tailored consultation service covering ELN, OD and FDM aspects

Designing RDM & ELN action research [7] pilots offered to research groups

✉ **DR. CHRISTIANE WETZEL**
*TEAM LEADER QUEST Program Evaluation*
BIH QUEST Center for Responsible Research
Charité - Universitätsmedizin Berlin, Germany
christiane.wetzel@bih-charite.de

COMPASS QUEST Program Evaluation

RE-PLACE

BIH QUEST Center for Responsible Research