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Data Literacy for Libraries – A Local Perspective on Library Carpentry

Abstract: In the past decades, libraries have developed into sophisticated information centres. This evolution requires a new set of computational expertises and competencies but also a change in the general attitude toward continuous learning. “Library Carpentry”, as a lesson programm of the “The Carpentries” community offers an elaborate and evidence-based collection of approaches for efficient teaching of the required computational skills and concepts. This article introduces Library Carpentry and presents how it is applied at ZB MED - Information Centre for Life Sciences as a foundation for teaching digital literacy.

Keywords: Library Carpentry, The Carpentries, data literacy, digital literacy, computational thinking, live-coding

Digitale Kompetenzen für Bibliotheken aus örtlicher Perspektive von Library Carpentry

Zusammenfassung: In den letzten Jahrzehnten haben sich Bibliotheken in anspruchsvolle Informationseinrichtungen entwickelt. Diese Entwicklung erfordert IT-Kenntnisse und ebenso eine Bereitschaft zu kontinuierlichem Lernen. “Library Carpentry”, ein Trainingsprogramm aus dem Angebot der Non-Profit-Organisation. “The Carpentries”, bietet eine evidenzbasierte Zusammenstellung von Methoden für die effiziente Vermittlung der erforderlichen Programmierfähigkeiten und dahinterliegender Konzepte. Der Artikel führt in Ideen von “Library Carpentry” ein und zeigt wie diese von ZB MED - Informationszentrum Lebenswissenschaften in Köln umgesetzt werden, um das Unterrichten digitaler Kompetenzen in Bibliotheken voranzutreiben.

Schlüsselwörter: Library Carpentry, The Carpentries, Datenkompetenz, Digitale Kompetenz, Computerdenken, Live-Coding

1 Introduction

The work *of* libraries and the work *in* libraries changed dramatically during the last decades. Notably, research libraries changed from suppliers of printed literature to scientific information management

facilities, which not only provide printed and digital literature, but also maintain numerous research artefacts including data and software. Classically, users are taught in information literacy as well as in the use of literature administration programmes. Additionally, libraries became institutions for knowledge transfer to extend the competencies of their users.[1]

Library Carpentry is a lesson programme of the not-for-profit organisation "The Carpentries" that aims to develop "[s]oftware and data skills for people working in library- and information-related roles" as the website state.[2]

Library Carpentry offers workshops that focus on the benefits of digitisation for information institutions. The lessons aim to teach digital literacy and computational thinking to academic library staff in order to improve working processes and avoid repetitive steps in their daily work. The learning objectives also intend to empower the participants to effectively collaborate and communicate with IT and research computing experts. At best, the staff members work *on* the computer system and less *in* the system anymore and continue learning to deal with computers and programs to avoid repetitive tasks.

Training is conducted with primarily open source tools. In addition to developing technical skills, the workshops also introduce participants to concepts such as open science, reproducible research, and the FAIR principles.[3]

Library Carpentry is part of the broader Carpentries network which includes volunteers from across the world and a community exchange where they can share ideas and work together.[4]

In the last two years, a team of researchers and librarians at ZB MED - Information Centre for Life Sciences, Cologne, conducted more than 30 Workshops and trained more than 300 participants.[5] The steadily growing group of local volunteers - acting as helpers, instructors and trainers - also maintain learning material and contribute by being active in community programmes and governance. During the pandemic-lockdown and the contact ban of spring and summer 2020 in Germany, the team continued, like many others in the community, running and teaching online events.

[1] Acknowledgement: We thank Christopher Erdmann for the warm welcome to the Library Carpentry community as well as for his input and feedback on this article.

[2] Baker et al. (2016).

[3] Wilkinson et al. (2016).

[4] The Carpentries (2020).

[5] ZB MED (2020).

In the following sections, we provide further background on Library Carpentry including its historical development. We then focus on the establishment of the Library Carpentry volunteer group at ZB MED in Cologne as an example of the local adaptation of Library Carpentry concepts and ideas. Furthermore, the collaborations with other institutions are described. Finally, we present some insight into a new Library Carpentry course the Cologne group developed on the topic of Wikidata.

2 Educate the workforce of libraries in the digital century

Library Carpentry was initiated by James Baker in 2014 based on the blueprint of Software Carpentry, which was founded by Greg Wilson and Brent Gorad with the aim to teach computational skills to researchers.[6] In 2018, Software Carpentry merged with Data Carpentry to create the umbrella organisation "The Carpentries" and Library Carpentry soon followed and joined as the third lesson programme.

The Carpentries have developed clear concepts containing 1. audience, 2. objectives, 3. teaching principles and 4. supportive network for its members.

Audience: Library Carpentry workshops (usually 2-day or 4 half days) focus on the advantages of digitisation for information facilities. The lessons aim to teach digital expertise to employees of libraries - research libraries and public libraries. Here we see a future potential for Library Carpentry to foster the competencies of students, researchers and other users to learn about the digital potential that libraries offer.

Objectives: Library Carpentry participants are invited to learn basic computer skills and gain computational thinking. They learn for example how to use command line interfaces, how to code in the Programming language Python, or how to perform software code management with Git. The individual topics are represented by lesson-modules including SQL, Python, Git, Unix Shell, OpenRefine, Webscraping, Tidy Data, and FAIR. Further, lessons are planned or already under development including a lesson about the Linked Open Data platform Wikidata.

Teaching methods: Library Carpentry uses the didactical concepts of the Carpentries including: 1) hand-on learning and 2) close, frequent feedback (formative assessment) and 3) building on the insight that a safe space and a comfortable environment increases the learning outcome.[7] It is not just a phrase when the instructors ask the participants in advance to accept the Code of Conduct in order to guarantee a "welcoming and supportive environment for all people, regardless of

[6] Baker et al. (2016).

[7] Ambrose et al. (2010).

background or identity".[8] Instead, it supports each single person in their way of learning and the community as such. An important principle for the workshops is to permanently involve the participants in the lessons: Simultaneously to the live-coding in the front the learners reproduce the single steps on their own machines.[9] Ideally, the participants bring their own devices to the lessons. Hence, the needed software is installed and set up on the machines. By this the attendees are prevented from getting frustrated by a different system on their home computer when they continue learning after the workshop. Although the workshop concept addresses librarians which are assumed to have some knowledge about information sciences little previous IT knowledge is needed. The low-level starting point of the participants is one principle of The Carpentries. In order to provide tailored support for each learner the workshop instructor is assisted by so called "helpers". While the participants follow the instructions on their own machines they are frequently asked to give feedback. Different approaches are used fo this - a simple, low-tech but very efficient tool are the sticky notes: A green note sticking on the computer indicates a learner can follow and reproduce, a red sticky note informs about a problem which is then mostly directly addressed by the helpers. As interacting with computers often demands exact commands and expressions the helpers can easily support with solving simple syntax errors e.g. when a parenthesis is missing or a spatium was set at the wrong location. Normally, the error can be solved by helpers with few programming experience. Discussion of problems foster a peer-to-peer-learning. As a result former participants can often be convinced of becoming a helper in a subsequent session. An integral component of the workshop is feedback in terms as "formative assessment" during the session to address misunderstandings and via feedback rounds at the end of each learning session. Here the tempo of the teaching and the comprehension of the learners is evaluated but also other aspects of the teaching are open to be commented on. Errors made by instructors or learners are celebrated as opportunities to learn and grow.

A supportive network by and for volunteers: The Community of Carpentries is especially designed to bring the community members in constant exchange and thus support each other. Therefore, the Carpentries offer many different formats for working together in which community members can get involved. There are different types of Community Discussions including pre- and post-workshop discussions in which volunteer getting ready to teach or have recently taught can discuss their teaching experience with the community. Centered around a particular topic, themed discussion sessions are ranging anywhere from teaching the first workshop to community building strategies.

[8] The Carpentries (2020b).

[9] Nederbragt et al.(2020).

Also included are discussions which are aligned by rolles, e.g. Instructor discussions or (lesson) maintainer discussions. Carpentries conversations provide the community with the opportunity to learn about and discuss new developments and programs within The Carpentries organisation. In addition, biannual conferences, "Carpentry Con", are organized. The recent was one was conducted remotely due to the COVID-19 pandamic.[10]

It is worth mentioning the teaching material Library Carpentry like for all Carpentries lesson programmes and freely accessible Open Educational Resource (OER) and developed by the community on GitHub, a platform for collaborative source code development.[11] Lesson maintainers, but in principle any member community, can thus enter and participate in the development of a lesson at any time.

3 Adaptation of Library Carpentry by ZB MED

In Cologne we have been performing Library Carpentry Workshops since 2018.[12] We were able to build on the experiences of group members that were gained in the previous years from teaching Software Carpentry workshops. The first workshops had been conducted in cooperation with TIB-library in Hannover and Uni Mannheim. Soon the group expanded when two more colleagues finished their instructor training. One year later, again two more colleagues joined the group, not only as helpers but also as instructors.

Due to size of the local group a weekly peer-to-peer mentoring group ("Hacky hour") could be established to help local learners after a Library Carpentry workshop with support from others. The experience shows that such an offer can support the transition from novices to more advanced practitioners.

4 Collaboration

In order to bring the Library Carpentry content to a broad spectrum of learners ZB MED used and extended its network of partners. A close collaboration was formed with the Zentrum für Bibliotheks- und Informationswissenschaftliche Weiterbildung (Centre for continuing education in libraries and information sciences, ZBIW) which is situated at the TH Köln – University of Applied Sciences. The ZBIW is the official provider for training on information sciences of the North Rhine Westphalia region in Germany. Library Carpentry workshop are now a frequently offered component

[10] CarpentryCon (2020).

[11] Library Carpentry GitHub (2020).

[12] Seidlmayer et al. (2019).

of the training programme at ZBIW. Announcements are done via ZBIW's well established network and it is much easier to reach librarians who are not familiar with digital information channels like Twitter.

Further, workshops were conducted together with the Free University (FU) Berlin, Initiative Fortbildung für wiss. Spezialbibliotheken u. verwandte Einrichtungen e.V., University and City Library (USB) Cologne, Technical Information Library (TIB) Hanover, Staats- und Universitätsbibliothek Göttingen, the German Network for Bioinformatics Infrastructure – de.NBI (de.NBI) and others. Workshop coordinations are initiated by official requests to The Carpentries website or through personal connections with the volunteer group. Currently, the Cologne group strives to further foster the Carpentries community in Germany.

5 Participation in Lesson development

The ZB MED team is not only involved in the running of Software and Library Carpentry Workshops, but also in the maintenance and development of of various Carpentries lessons.

Currently, team members are active in the maintenance of the Library Carpentry Python as well as teh Git lessons and have contributed to the "Top 10 FAIR Data & Software Things" lesson.[13]

In addition, the team started the development of a new lesson for Wikidata due to its strong connection to the Wikidata and WikiCite community.[14] The Association of Research Libraries also appointed 2109 a group of experienced Wikidata users to help librarians take advantage of the possibilities and opportunities Wikidata offers.[15] This is why the ZB MED group decided to develop a Library Carpentry workshop about Wikidata. The objective is to enable librarians to use Wikidata as an auxiliary resource to facilitate their work. On the other hand, the information skills of librarians can also help to improve the data in the Wikidata platform. Compared to Wikipedia, Wikidata is not only human-readable but also machine-readable, making it possible to make queries in the Wikidata database.[16] Basically, anyone can create new entries or edit existing entries and through the processextend the open knowledge graph. Each item can be placed in a semantic triple, also called RDF triple. By building knowledge and information in this semantic fashion, Wikidata creates a sustainable and searchable knowledge resource.

[13] Erdmann et al. (2019).

[14] WikiCite (2020).

[15] ARL (2019).

[16] Pintscher (2019).

To teach how the great potential of Wikidata can be translated in value for librarians, a training concept was developed, in which librarians can become familiar with the platform. They are shown how they can enrich Wikidata with data and how they can use the platform for themselves in their daily work. The lesson gives participants insight into different ways of editing Wikidata items and how Wikidata can be used as a data source for their libraries. Librarians can benefit from the SPARQL based queries and the various tools used for automated data import, export and analysis. Simple search approaches are taught - for example how to query Wikidata to return DOIs or ISBNs of a publishing house for a certain year.

The lesson follows the common structure of the Carpentries and is divided into six episodes: "What is Wikidata?", "Underlying concepts of Wikidata", "Introduction into editing", "Advanced editing", "Introduction to querying", "Advanced bulk updating, bots". Since the Wikidata lesson was also designed for librarians who are not familiar with the platform, the lesson has only few requirements. Participants do not need any previous knowledge or skills about Wikidata, but only a stable internet connection.

Currently the Wikidata lesson is in development status, but the ZB MED team aims to bring it to the level of a core curriculum lesson.

6 Library Carpentries under pandemic conditions

During the Covid-19-pandemic and the related contact ban, workshop coordinators and instructors had been confronted with a new situation: several workshops had to be canceled quite spontaneously. In a short period of time, the community came together to discuss how to implement Carpentries concepts online using video conference tools. In particular it was an issue how to transfer certain methods e.g. the continuous feedback by sticky notes to the digital environment. Also, support from helpers was a matter of discussion. The community decided to use the video conferencing tool Zoom since it is possible to transfer many concepts (e.g. to Red or green button that appears next to the learner's name in the participant list). This function is similar to the sticky note function but needs to be highlighted during the lessons. Also the role of the helper is slidely different in a remote setup in comparison to an in-person-workshop.

7 Conclusion

The implementation of Library Carpentry at ZB MED continues to be a success story. Since 2018, ZB MED has established a broad training program for librarians, both locally and regionally.

The group of instructors and lesson maintainers continues to grow, adding to a strong foundation of community members, and is actively contributing to lesson development (e.g. Wikidata and FAIR lessons).

To help participants apply what they have learned in workshops, ZB MED implemented a weekly "Hacky hour" - a code club in which peer-mentoring can help to foster and extend the acquired skills together.

Even during the pandemic lockdown, the group found a way to continue with teaching and learning. Adaption is always necessary given the audience and situation, and in the case of the pandemic, workshops moved to digital use. The Wikidata lesson is one example that reflects the current needs around documenting the pandemic.

Getting something like this to work can only succeed if you are part of a strong network. The ZB MED Library Carpentry volunteers work in close collaboration with partners in the international network and with institutes at the local level such as the ZBIW.

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