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One Resource to Teach Them All

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Abstract. Open Educational Resources (OER) allow for free access to educational materials and increase the chances of educational equity. We developed the DataPLANT OER, a teaching material resource based on the concept of annotated bricks along didactic paths. Our concept builds on a levelled approach with the brick, unit and dissemination level, is environment-agnostic and can be implemented in any desired technical framework. It balances customization and reuse and aims at one OER to teach them all.

Keywords: Open Educational Resource, OER, Teaching Material, Markdown, Metadata, YAML, front matter, didactic path

1. Introduction

Creating high-quality educational resources can be a challenging and time-consuming process. Besides providing original content, this process usually builds on the reuse of existing resources. Considering the tremendous amount of educational content available, this can be a daunting task for many educators. Teaching materials are oftentimes scattered, hard to find, and fragmented.

Following the principle of Open Educational Resources (OER) to promote easy access to educational materials and increase the chances of educational equity ([1]), a central collection of such materials should allow the community to add and improve contributions with transparent and traceable authorship and licensing of contents. We aim at one OER for all: a lightweighed, central, reusable, adaptable, open and contribution-open resource of materials for varying learning environments. Therefore, we develop the DataPLANT OER, a teaching material resource based on the concept of annotated bricks along didactic paths.

2. Three Levels to Balance Customization and Reuse

Our concept builds on a leveled approach with three levels called bricks, units and disseminations. Bricks are the smallest possible educational content snippets. Due to their compact nature, these can ubiquitously be reused. Bricks are designed for modular combination towards larger, coherent building blocks (units). A brick can be a paragraph of text or an individual slide. Units cover a complete idea, thought or topic and, thereby, are equally suited for modularization. Bricks, bricks and units or multiple units can be combined to form even larger units and eventually full-fledged disseminations.

Disseminations transport a customized didactic path specific to the learning environment of the target group or person. This can occur at a specific event or within another format like an article, knowledge base or a self-guided tutorial. Several disseminations can be combined for a more complex didactic scenario up to a didactic series built from multiple disseminations and based on a curriculum.

Teaching material can vary in format, purpose and addressed level of a learner's expertise. Each level enables maximal reuse and encourages for both, the creation of new content as well as improvement and update of existing content. This levelled approach balances the need to be able to reuse material “as-is” and the customization with own content to create materials tailored to a specific learning environment.

3. From Bricks to Disseminations with Metadata

We have designed minimal tools to assemble bricks into units or disseminations. Technically, all information required for this can be provided in one file. In its main section, this file comprises all paths to the individual files in the desired order to compile the different building blocks into units or disseminations. Didactic and other information are provided by the user in the “header” of the file called the YAML front matter section. Moreover, the user can add comments in the main section to share the idea of the didactic intention more precisely when arranging the different building blocks in addition to the descriptions in the YAML front matter. Thereby, this file is a condensation of the user’s didactic path for the unit or dissemination that is linked with its implementation. It can be extended with customized style files in contrast to the default settings.

In a simple form, a brick contains the information for a single presentation slide, including contents such as a headline, a text body (e.g. with paragraphs, bullet points) and the reference to an image to be presented. Bricks are written in markdown ([2]) which allows to add metadata in the YAML front matter section, which is not displayed in the final outcome.

Inspired by recommendations of [3] and [4], we use the YAML front matter section for standardized terms covering didactic (educational), legal and technical metadata in bricks, units and disseminations and all files compiled thereof. Virtually, any kind of metadata can directly be associated with the teaching material. Didactic metadata attributes include, e.g., learning outcomes, skills, requirements, target audience and teaching mode. The legal section focuses on material authorship and licenses and allows to define terms of reuse “in both directions”, i.e. what is the source to a material that was reused while creating content (like a brick) and under what conditions can the created content itself be reused. The technical section aligns with the chosen technical implementation like the interpreter of the markdown content and the associated styling or formatting to render the outcome. The types of attributes differ between the three levels and aggregate from brick over unit to dissemination.

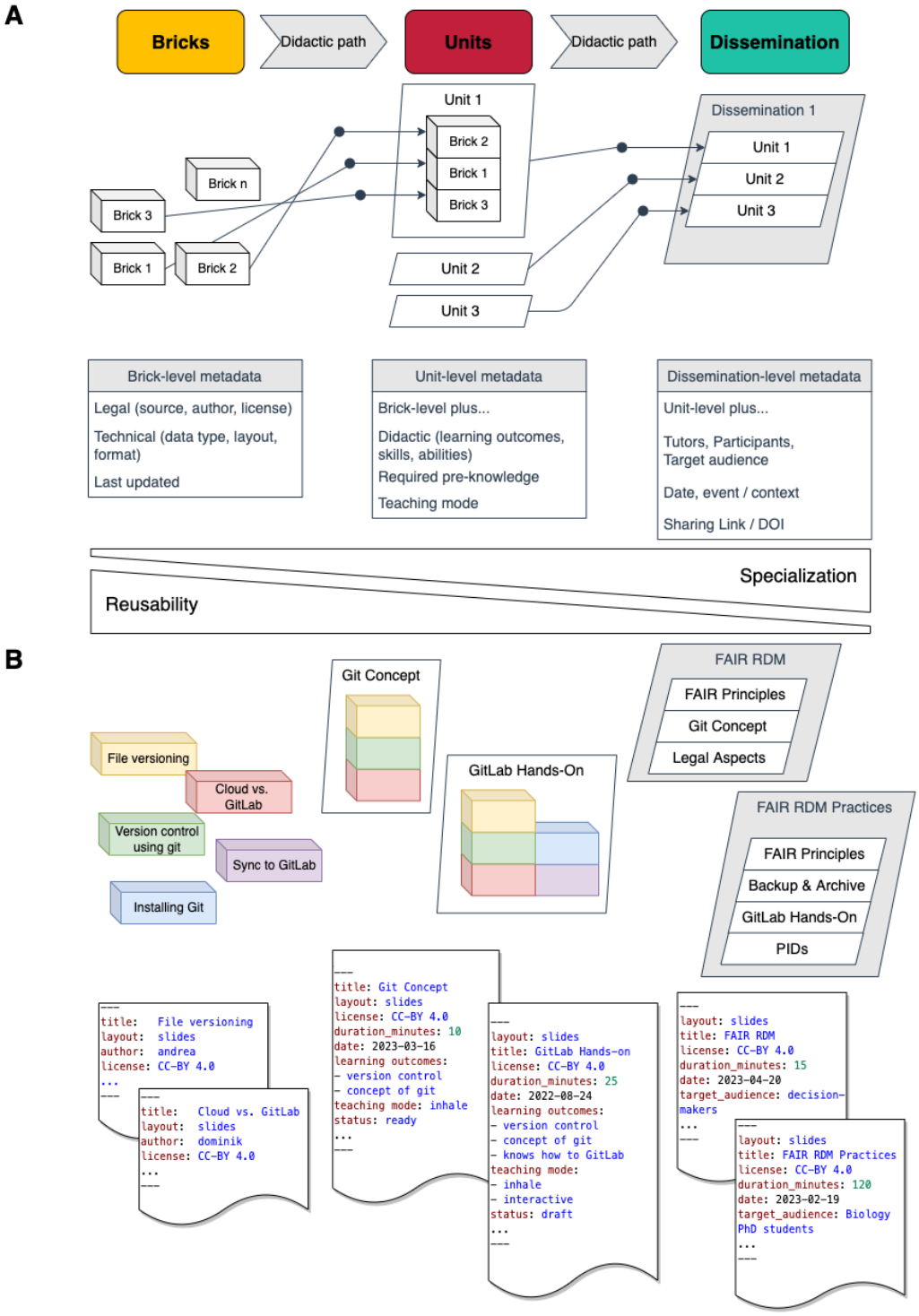

Figure 1: A) Modular concept for the DataPLANT OER. The educator can assemble any number of bricks into a unit. Together with other units (preassembled or customized), the educator can then compile the teaching content for a dissemination. This concept offers the perfect blend of content reuse and customization for distinct learning environments (courses, workshops, etc.).

B) Example "version control using Git" to elaborate our leveled concept. One could design individual bricks to elaborate the benefits of file versioning, how Git may be helpful for this purpose, how Git platforms like GitHub and GitLab overlap with or are different from other cloud services, etc. These bricks could now be compiled in an independent unit, teaching Git version control only on a conceptional level without much technical depth. This unit could be taught to an audience with little technical or coding background. The same bricks

could be combined with more technical details on how to install Git, how to Git version control local files and share them via Git-backed platforms to compile a unit as the basis for a tutorial, demo and workshop – three different formats – to transfer hands-on knowledge to an audience that would actually employ Git. Both units could eventually be assembled with other units to design a dissemination for a larger context such as a course about “FAIR RDM Practices” targeted at PhD students.

4. Brief Notes on the Technical Implementation

Our basic levelled concept is environment-agnostic and could be implemented in any desired technical framework. For teaching materials collected in DataPLANT, we have decided to create bricks (and consequently units and disseminations) in form of “markdown”-formatted text files and collect these together with images in a shared GitHub repository (see example at [5]) aiming at an OER.

Using the YAML front matter, different markdown interpreters can render the provided content to a defined output like the Marp presentation ecosystem ([6]) or reveal.js ([7]) for markdown-based slides, static website generators such as Fornax ([8]) or pandoc ([9]), which allows to convert into virtually any relevant document file type. As such, the same input (markdown text) can be rendered to different outputs (slides, articles). Designed as pure text files, markdown files represent an open file format and work well with text-based version control such as Git ([10]). Also, the schematized YAML front matter allows to programmatically read out the metadata attributes to build a database to facilitate findability and reuse of teaching materials.

5. Conclusion & Outlook

Our envisioned concept offers great chances for spreading the spirit for community endeavors and driving the use of OERs. Despite the learning curve at the beginning (how to write markdowns, how to assemble units and disseminations, and maybe even how to use Git), users can benefit immensely from the balance between reusability and specialization. While DataPLANT data stewards support content creators, we also work on easier in(-and-out) routes, interoperability as well as user friendly and light maintenance options for all user flavors.

Data availability statement

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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