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Abstract:

The "Digital Edition Levezow Album" project was an interdisciplinary collaboration between the Department of Art History at the University of Hamburg, the State and University Library Hamburg, and the Hub of Computing and Data Science (HCDS) at the University of Hamburg. The project aimed to digitally process and interactively visualize a previously unexplored sketchbook from the late 17th century, containing drawings on anatomy, antiquity, proportion studies, and natural history.

By leveraging modern technologies such as digital editing techniques and advanced image processing, the Levezow Album was made accessible to a broad audience. Each page of the album was accompanied by detailed explanations authored by students of the Department of Art History. These texts provide context regarding the significance, origins, and intricacies of the drawings. Additionally, an interactive commenting feature allows users to suggest alternative or complementary sources and engage in a dialogue about the artworks.

This project demonstrates how digital methods can be used in the humanities to reinterpret historical artefacts and make them accessible to a wider, global audience. In addition, it provided a first experience of digital research methods and digital humanities for the art history students involved in the project. It serves as an example of the successful integration of research, education, and research software engineering to promote cultural heritage.

Keywords: Digital Humanities, Cultural Heritage, Digital Edition

1 Introduction

In 2024, two parallel exhibitions took place as part of a cross-institutional project developed by the Hamburger Kunsthalle (Kupferstichkabinett) with the University of Hamburg (Art History

Department) and the Hamburg State and University Library.[1] The exhibitions presented illustrations from artists who studied professionally, as well as amateur drawing practised in private. At the Hamburger Kunsthalle, the focus of the presentation was on hand drawings from the 15th to 19th centuries, demonstrating the potential of artistic-scientific drawing as a tool for imparting knowledge and gaining insight.

At the Hamburg State and University Library, the focus was on an unexplored and inconspicuous drawing album from the Hamburg State and University Library, the Levezow Album. This 71 folio page compendium from the late 17th century, named after its creator Joachim E. Levezow, combines drawings from the fields of anatomy, antiquity, and natural history. It is particularly fascinating and ideally suited for university educational use as it illustrates the techniques of an amateur artist producing original illustrations as well as reproductions and interpretations of existing artworks [SW24]. This exhibition took place between 7 November and 20 December 2024[2] and a 3D virtual tour is available online.[3] Selected pages from the album were accompanied by detailed explanatory texts and links to their origins or comparable illustrations, written by students participating in an art history seminar. These texts were included in the catalogue which accompanied the exhibitions [SW24] and in the exhibition at the Hamburg State and University Library.

The subject of this paper is the digital edition of the Levezow album (https://levezow.hcds.uni-hamburg.de), enabled by a multi-disciplinary collaboration between the Art History Department and the Hub of Computing and Data Science (HCDS) at the University of Hamburg and the Hamburg State and University Library. We created an interactive website, allowing the Levezow Album to be made accessible to a broad audience. The primary goal of this project was to offer an enriching, immersive educational experience combining historical art analysis with interactive digital media. It aimed to make art history accessible and engaging for a wide audience, fostering a deeper appreciation and better understanding of the artworks presented in the digital album. In doing so it also addresses the divide between traditional virtual representations of artefacts and modern web app interfaces of design agencies and companies.

This project demonstrates how digital methods can be used in the humanities to explore and make historical artefacts accessible. It can be seen as an example of the successful integration of research, teaching, and digital technology to promote cultural heritage.

The following sections give some background on the history of digital editions and collaborations between researchers in humanities and computer science (Section 2), followed by an account of our collaboration process. We then describe how the digital edition was designed and implemented (Section 3), and provide examples of the various ways in which the drawings and their texts can be accessed (Section 4). We conclude with some reflections on the project outcomes (Section 5).

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[1] https://www.hamburger-kunsthalle.de/de/ausstellungen/akte-antike-anatomie
[2] https://blog.sub.uni-hamburg.de/?p=38986
[3] https://schaukasten.sub.uni-hamburg.de/virtueller_rundgang/ausstellung/2024/akte_antike_anatomie

2 Background

2.1 What is a Digital Edition?

There are ongoing and ever-evolving discussions of the meaning of the term *digital edition* (see for example [Sah16, BKA+18, RKB+20]); it has evolved from an early meaning primarily focused on a faithful recreation of an analogue object to much more wide-ranging interpretations including a huge variety of different styles of presentation and interfaces. In the course of this project we developed our concept during discussions between the teams in the department of Art History and the Hub of Computing and Data Science, discussed in more detail in Section 3.

This collaborative project presents art history as a discipline working in visual science and conveys the relevance of graphic exploration, documentation, and recording of knowledge content in a digitally influenced world. The Levezow album ([SW24]), is a sketchbook with 71 folio (double sided) pages, and artistic content appears on 133 of the individual pages; some pages were left blank. Some illustrations cover a whole page (as in Figure 5) and occasionally two pages (as in Figure 6) but in many cases several smaller drawings appear together on a page; these smaller drawing are often thematically related (as in Figures 3 and 4). Due to a lack of available archival sources about Joachim E. Levezow, the drawings are the sole starting point for any assertions about the intellectual and artistic profile of the album. The working hypothesis is therefore, first of all, to understand the album as an object of materialized knowledge that records Levezow's artistic attempts. As part of the art history seminar which researched the album, each illustration was given a title, and many are now accompanied by detailed explanatory texts and links to their origins or comparable illustrations.

An early example of an approach to creating a digital edition from a similar album is the 2003 digital edition of the St. Alban Psalter, in which digitized views of the pages of the psalter are displayed side by side with transcriptions and explanations[4]. The new annotated edition of the Utrecht Psalter[5] [Jas15], which has been online in its present form since June 2015, uses a similar approach. As the available options for web page design and functionality have developed, more such digital editions have been created. Examples include a book belonging to Ulrich Daniel Metzger, an early 18th century artist specializing in reverse glass painting, which contains drawings and handwritten texts which he made during his travels through Germany and neighbouring countries between 1708[6], and an 'album amicorum' autograph book kept by Philipp Hainhofer, a merchant banker, diplomat and art collector in Augsburg (1578–1647), which contains signatures of many great names from across Europe[7]. The design of our Digital Edition is described in Section 3.2, and its implementation in Section 3.3.

2.2 Interdisciplinary Collaboration

From the beginning of this project we were aware that collaboration between interdisciplinary teams from the humanities and computer science does not always run smoothly and we were

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[4] https://www.albani-psalter.de/stalbanspsalter/english/index.shtml

[5] https://psalter.library.uu.nl

[6] https://ulrichdanielmetzger.digital

[7] https://stammbuch.hab.de/stammbuch

keen to avoid any obvious pitfalls [GH18, KBW$^+$25]. As Terras points out in [Ter12, p. 223], "Most failures in projects, in my experience, stem from a lack of communication". She points out that it is important for all concerned to understand the desired outcome of the project, and to agree on how this is going to be achieved. In [ACL21], the authors describe their workflow for managing collaborative work between digital humanities and visualization. One of the major aspects described is the process of aligning the understanding of one another's terminology. We describe our workflows and communication processes in Section 3.1.

3 Creating a Digital Edition

3.1 Organizational Details and Collaborative Workflow

The development of the digital Levezow Album was shaped by a collaborative and iterative process involving designers, research software engineers, librarians, and art historians. Early in the project, we created wireframes [Cha20] and mock-ups and discussed possible interface solutions, which helped us align our distinct disciplinary perspectives. A key part of this phase involved learning each other's vocabularies and agreeing on shared terminology. Although our organizational structure differed from traditional digital editions, we similarly underwent a process of aligning conceptual approaches — especially regarding how art historical image analysis is conducted and how accompanying texts should be structured.

Based on these discussions, we developed a shared spreadsheet to manage image data, which we refined together with the art history team. This included negotiating metadata priorities and clarifying what such structured data could be used for — for example, extracting relevant fields from textual documents for web integration.

Throughout this phase, weekly meetings were held between the HCDS and art history teams to answer open questions regarding the students' writing process and to clarify technical implementation details. These meetings also served as a space to test and decide on design elements using A/B testing in a sandbox environment. This close, continuous exchange enabled mutual learning: art historians gained insight into digital methods and had an active role in shaping the platform, while developers benefited from deeper understanding of the content and scholarly priorities.

3.2 Design Decisions

The design concept of the digital Levezow Album deliberately combines the visual aesthetics of the historical object with contemporary design principles to present the 17th-century sketchbook in a modern digital context. The goal was to evoke the atmosphere of a library-like space of discovery without making the album appear as a static museum artefact. A dark background, against which the bright book pages stand out clearly, creates visual calm, supports barrier-free reading, and lends the interface a contemplative character.

Navigation is designed to be intuitive and follows familiar online usage patterns: simple, large icons allow for quick orientation; active functions are highlighted in red, inactive ones appear in light grey. Users can choose between two main viewing modes: a traditional book view, in which the digital album is presented as browsable, and a single-page view offering deeper insight into a
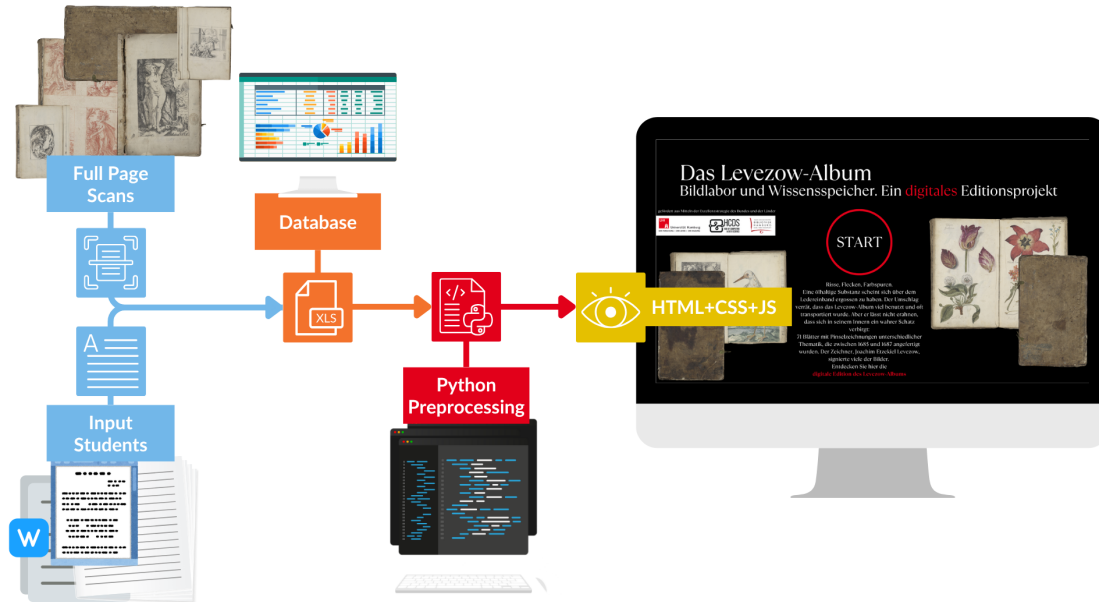
Figure 1: From 17th-century sketchbook to code to viewer - the technical path.

specific page. This detailed view enables seamless zooming into the drawings, accompanied by explanatory texts, comparative images, and further contextual links.

Particular attention was paid to combining content depth with user-friendly functionality: pop-up windows provide metadata and contextual information to support exploratory learning, which is further enhanced by thematic filters (for example, natural motifs like flowers or birds). There is also an integrated comment function which allows users to refer directly to specific book pages while contacting researchers through the means of a dedicated email address, so that they can actively engage in the scholarly dialogue.

The design was developed to meet the needs of various audiences—from students and researchers to the general public. It aims to create a low-threshold yet insight-rich experience that supports research-based learning through clear source references, interactive elements, and thematic interconnections.

3.3 Technical Details

The digital edition of the Levezow album contains images, textual data, and metadata which came from several different sources. Each page of the Levezow album was scanned in high resolution by the staff of the State and University Library of Hamburg. Students in the art history seminar wrote documents to accompany the exhibition in the State and University Library, and to appear in the catalogue which accompanied both exhibitions ([SW24]). The original documents contained metadata, which was extracted to populate a database used to generate the digital edition. The steps involved are shown in Figure 1.

As mentioned in Section 3.1, the database structure used in the project was collaboratively

developed by art historians and HCDS researchers, ensuring a clear separation between metadata and descriptive texts for automated processing. Unique IDs linked the image files to their corresponding metadata and texts. The metadata included for example the title of a picture, its folio number from the sketchbook, the painting/drawing technique used, and links both to related drawings in the sketchbook and other paintings which Levezow had used as a basis for his illustrations. The descriptive texts can refer to one or more pictures, and in addition, some pictures were grouped together into categories such as 'flowers' or 'birds'.

The database fields were as follows, and a description of their use in the Digital Edition is given in Section 4.

Image ID There may be more than one image ID per page

Image title Each image has been given a short title

Folio number From the sketchbook

Drawing technique and/or materials Such as pen, pencil, paintbrush watercolour, gouache, copper engraving

Artist Almost all sketches are by Levezow, but a few are possibly by other artists

Category (optional) One or more of: allegory, animals, birds, faces, flowers, the human form, landscape, mythology, nature scene, ornamental, religion

Text document (optional) Link to a document containing the a description of the sketch or of several linked sketches

Author (optional) Where a text is present, the author name

Short Description (optional) Where no full text is available, a once sentence description

Signature (optional) There are very few signatures as the sketchbook was used almost entirely by Levezow himself

Date (optional) Mostly undated

Source (optional) Some sketches are based on works by other artists

Source link (optional) Where available, a link to the URL of the named source

A Python-based processing pipeline took the database, the written texts, and the images and generated a collection of web pages which consist of HTML, CSS, and JavaScript. We used the OpenSeadragon JavaScript module [GKT+24], an open-source viewer for web content that supports high resolution zoomable images. This library is used in many digital humanities projects including the Utrecht Psalter, Ulrich Daniel Metzger, and Philipp Hainhofer digital editions referred to in Section 2.1.

The main page of the digital edition presents all images in a navigable sequence (see Figures 3, 4 and 5a) with buttons providing access to summary metadata and introductory text. Separate

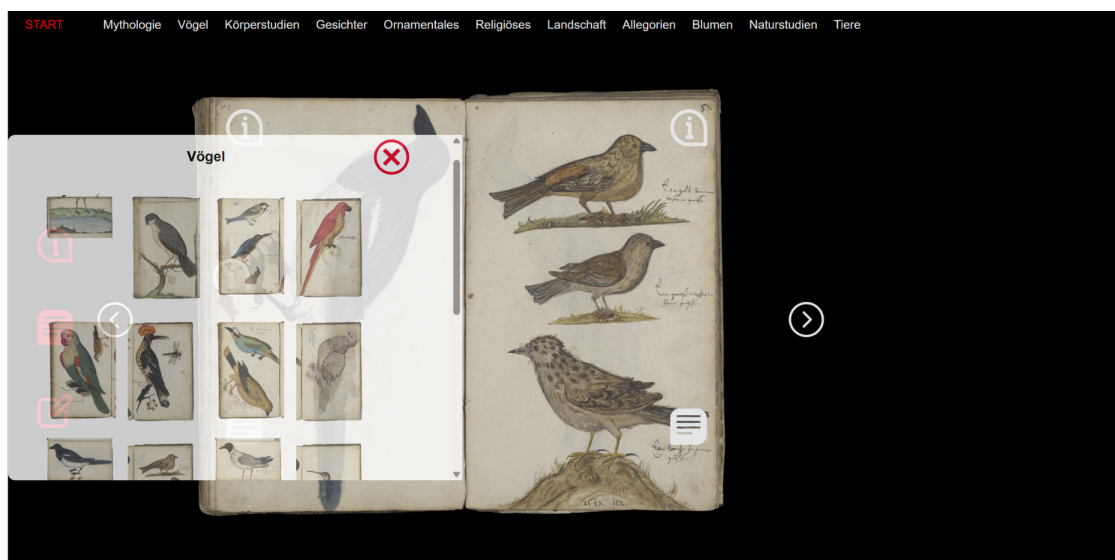Figure 2: Levezow digital edition functional overview

Figure 3: Levezow folio 58r with pop-up showing images included in the category 'birds'

web pages for each individual page of the album display a zoomable image alongside the full explanatory text and metadata (see Figures 5b to 5d and 6). The main page and individual pages are generated in advance as static web pages with JavaScript functionality used to create pop-up descriptions with clickable links.

3.4 Open Science

In keeping with open science practices such as the FAIR principles [WDA⁺16, CKB⁺22], we make the results of our collaboration openly available.

We have published the software used to create the digital edition at the research data repository of the University of Hamburg[8] and on the Github page of the HCDS[9] under a GPLv3 license. In addition to the source code itself, the repository provides samples of the input data format as a guide for potential reuse.

The images from the exhibition are available separately from the State and University Library of Hamburg under a Public Domain Mark 1 License.[10]

The texts which appear in the digital edition and in the published catalogue were created by students within the context of a university seminar, supervised by Prof. Dr. Iris Wenderholm, as part of their coursework at the Department of Art History, University of Hamburg, as described in Section 1. The students were fully informed about the digital publication framework, and all contributors explicitly agreed to the online publication of their texts as part of the digital edition. The texts are publicly accessible through the interactive platform of the digital edition. However, we do not distribute these texts separately as a downloadable data package, in order to preserve the contextual integrity of the edition and in line with the scope of the agreed usage.
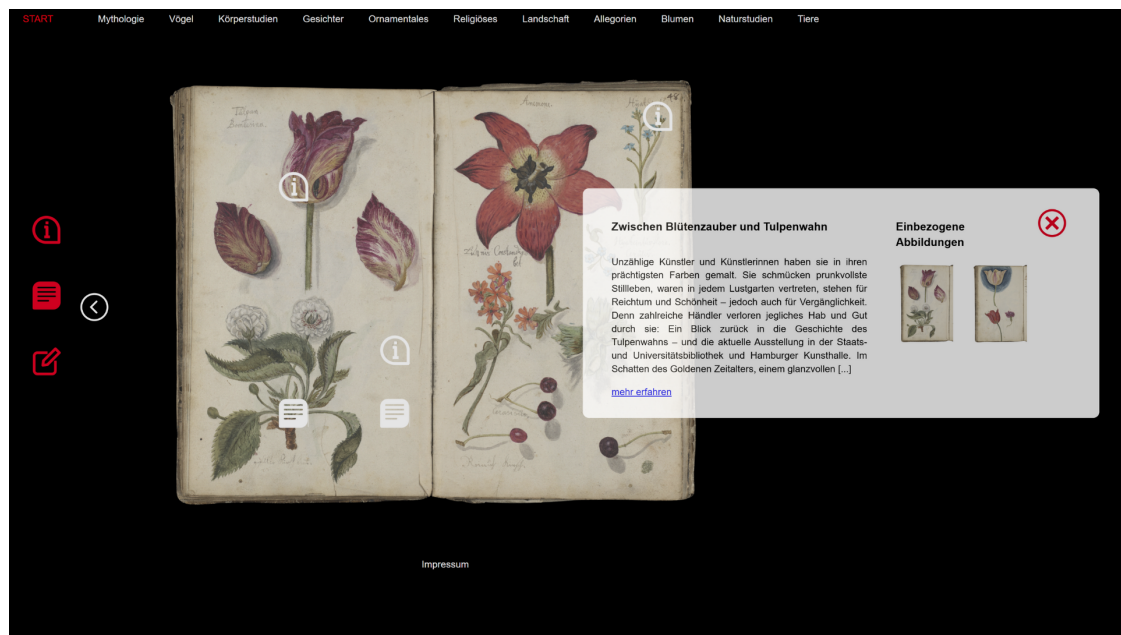
4 The Digital Exhibition

A visit to the Levezow digital exhibition begins with a landing page which leads to a functional overview of the digital edition, displaying information about navigation options and viewing modes, as shown in Figure 2. The visitor is then shown the front page of the book, where an information icon allows access to an introduction to the sketchbook contents and its author. Subsequently, the visitor can navigate through the book by means of the page navigation arrows or by choosing a category from the list at the top of the page. If a category list is chosen, this brings up a pop-up window showing all the corresponding images, and clicking on one of them navigates directly to the appropriate page in the book. An example is shown in Figure 3 where the visitor has selected 'Vögel' ('birds') from the categories at the top of the page.

If information is available about any of the images on a given page, one or more white buttons are displayed on or near the images. The 'info' icon shows information about a single image and the 'blog' icon links to longer texts which refer to multiple images. In the two pages shown in Figure 4, several images on each page have information available, and some are also included in the same blog post. In both cases the visitor has clicked on the blog icon and the introduction to

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[8] 10.25592/uhhfdm.17802

[9] https://github.com/uhh-hcds/levezow-album

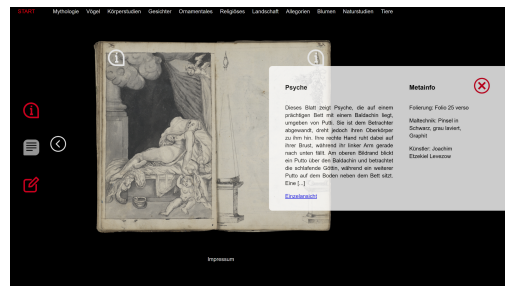[10] https://resolver.sub.uni-hamburg.de/kitodo/PPN1886432295
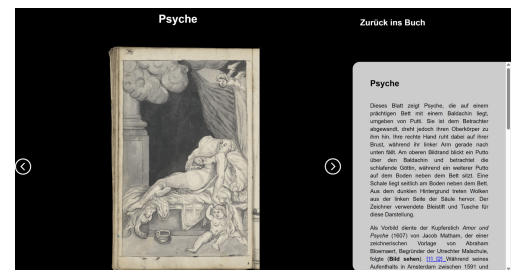
(a) folio 47v and 48r

(b) folio 51v and 52r

Figure 4: Levezow pages with illustrations of flowers and pop-up of a shared blog post
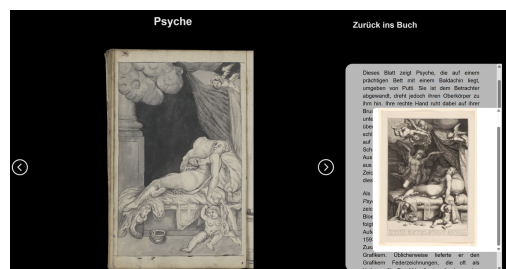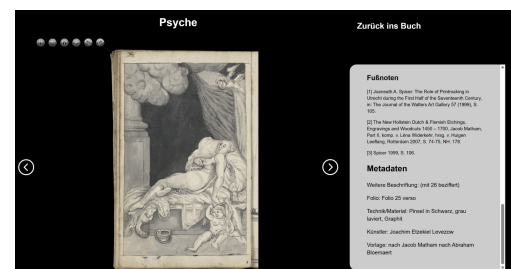
(a) Main page

(b) Individual page showing description

(c) Individual page with related image pop-up

(d) Individual page showing metadata and references

Figure 5: Levezow folio 25v Psyche

the blog post is shown in a pop-up window, along with links to the images described in the post.

Figure 5 shows four views of the figure of Psyche from Greek mythology. In Figure 5a, we can see the main Levezow album page, and the visitor has clicked on the information icon, producing a pop-up with the first few lines of the text which accompanies the image, and a summary of the metadata available. In Figure 5b, the visitor has clicked on the pop-up link 'mehr erfahren' ('read more') and arrived at the individual page for this image, where the full description can be seen. This text contains a link to an external image, and when this is clicked the image is shown next to the Levezow drawing for comparison Figure 5c). The visitor can thus see that Levezow's drawing is a (modified) copy based on a copperplate print by Jacob Matham, an important Dutch artist of the 17th century, which itself was based on a drawing by another 17th century Dutch artist Abraham Bloemaert. In Figure 5d, the visitor has scrolled down the text window, where the end of the description plus footnotes and metadata information can be seen.

The illustration of a lapwing (Kiebitz) is an example of how the digital edition can enhance a visitor's understanding of the artwork in a way which is not possible with the analogue version of the album. Levezow appears to have originally drawn the lapwing across an entire double page, but at some point the pages became separated, so that the feet of the bird can now be found at the beginning of the album on folio 1b recto while the body is many pages away on folio 61a verso. It is thought that the entire picture was probably originally located in the later position, since many other illustrations of birds can be found in the neighbouring pages. In the digital edition we have been able to reunite the two halves of the bird so that the illustration can once again be seen in its original state (Figure 6).
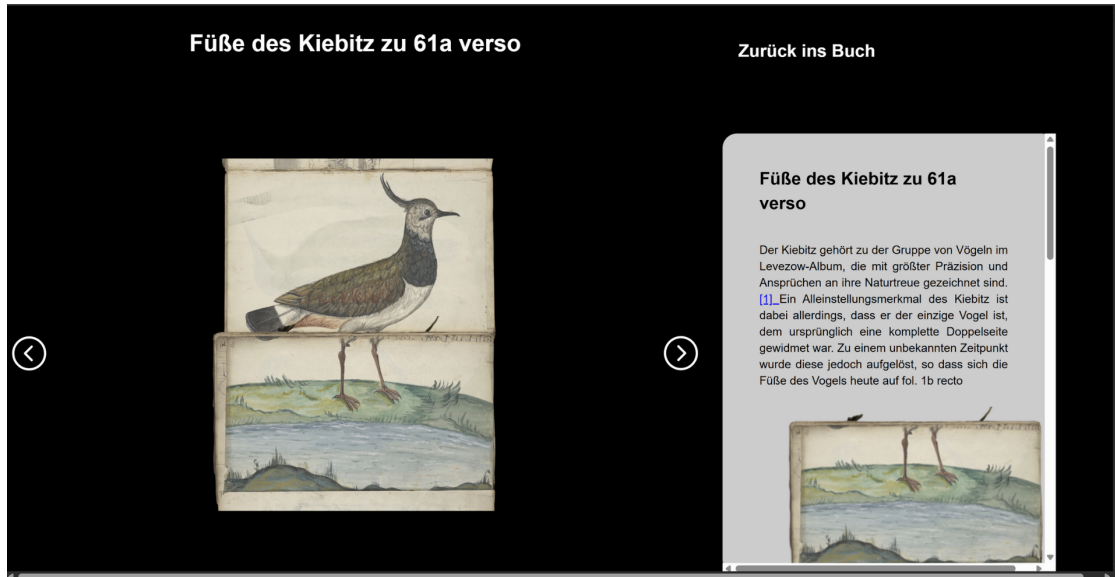
Figure 6: Levezow folio 61a v and 1b r Lapwing (Kiebitz)

5 Conclusions and Future Work

We presented the Levezow digital edition, a multifaceted web presentation of a historical sketch-book enhanced with commentaries and cross-references. Combining students' work in an art history course with a customized web presentation, it represents a cross-disciplinary collaboration that highlights how traditional scholarly contributions can be interfaced with modern media solutions to provide an enhanced access to general audiences.

A special highlight of the project was the connection to the physical object: the original sketch-book was featured in an exhibition at the Hamburger Kunsthalle. Visitors were able to access our digital edition directly from the exhibition via a QR code. This provided them with the opportunity to explore the sketchbook in its entirety—far beyond the few selected pages visible behind glass—thus creating a richer and more immersive engagement with the artefact.

During the process which led to the creation of the Levezow digital edition, the collaboration strategies laid out by the project allowed us to navigate the communication challenges inherent in multi-disciplinary teams. Despite occasional misunderstandings on both sides, the collaboration was always marked by a spirit of openness and mutual respect. The process proved to be a rewarding learning experience for all involved: the HCDS research software engineering team gained insight into the world of art and art history, while the art history students developed a deeper understanding of metadata and digital methods. The staff from the art history were able to significantly deepen their understanding of digital approaches, which will now inform future seminars, helping to further advance the integration of digital methods into the field of art history.

We have been able to build on the experience of the Levezow Digital Edition for a subsequent project within the University of Hamburg, in collaboration with the Cluster of Excellence "Understanding Written Artefacts" in the Centre for the Study of Manuscript Cultures. This

project displays entries from the Guestbook of Miryam and Moshe Ya'akov Ben-Gavriêl from the early-mid 20th century[11]. We again made use of the OpenSeadragon library, and although the structures of the images and metadata were too different to allow us to reuse the original software, we were able to make use of some parts of the code from the Levezow project. We plan to investigate the possibility of modularising parts of the codebase in order to be able to build on it more easily in future similar projects.

The close-knit communication and the customization that the HCDS could offer resulted in a product that was tailored to the specifics of this art project. The resulting digital interface matched the work done by the art history group much more closely than if an off-the-shelf solution had been employed. Many appreciated that the outcome was not a traditional digital edition, but rather an innovative format that reflected the interdisciplinary nature of the project and the multi-layered and interconnected contributions of the students. In the end, everyone was highly satisfied with the results and the shared journey which led there.

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