



IO3 DaLiCo VIRTUAL LEARNING SPACE

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IO3 DaLiCo VIRTUAL LEARNING SPACE

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Abbreviations:

DEB - University of Debrecen

HAM - HAW Hamburg

UT - Hogeschool Utrecht

VAL - Universitat Politècnica de València

ABSTRACT

Within the course of IO3, a virtual learning space for students has been created in the form of a prototype for an e-learning course. This learning space is the result of the cooperative project work of the DaLiCo partners. Concept, development, design, and use are described.

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Introduction

The aim of the intellectual output (IO) 3 is to build prototypes for the data literacy learning spaces, these prototypes will consider mainly the virtual components and is thus realized as a virtual data literacy course.

As a starting point for the whole project and hence also for this IO the mutual conceptual understanding of data literacy is based on the Ridsdale matrix (Ridsdale et al 2015). In the further progress of the project, the conceptual understanding was extended to Schüller (Schüller 2020) and finally structured by the DaLiCo dimensions (see result description IO1) when the course was implemented.

The data literacy learning space aims mainly at the students as a target group who use this learning space for independent learning. Students can come from different subjects and semester, low awareness for the relevance of data literacy is expected and basic methodological skills (empiricism, statistics) are assumed (as regular part of curricula).

This course offer is also intended for lecturers and teachers and can be used as part of different formal learning settings (e. g. certain educational formats like train-the-trainer-concepts).

This concept is meant to be transferable and modular and therefore adjustable to the specific demands of the partner universities, this refers to the variety of technical standards e.g. used for technical learning environments and to the different needs in terms of contents.

Development of the Output

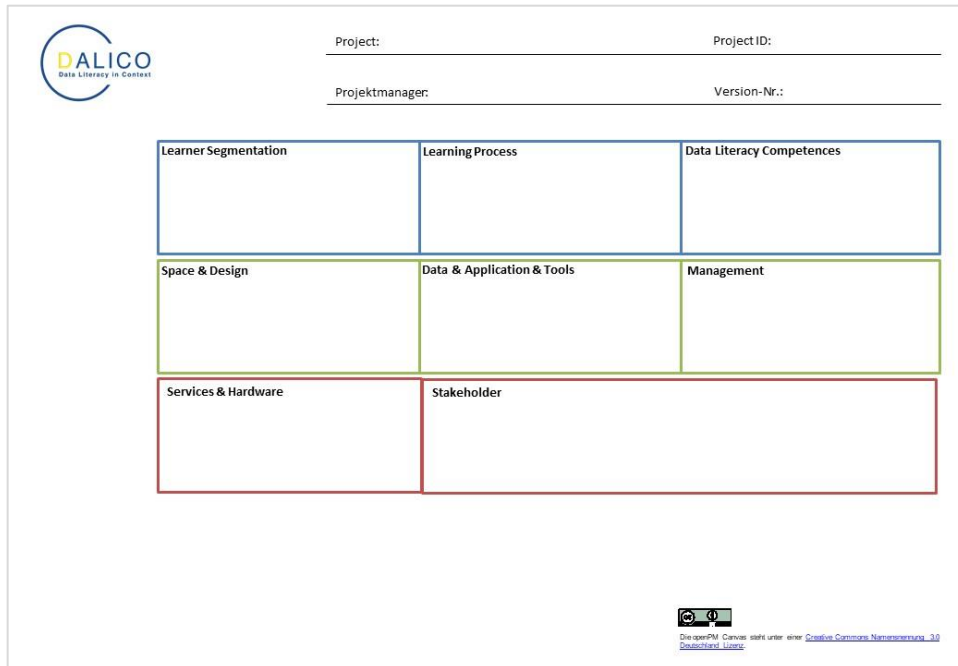
The project plan provides for an approach consisting of five tasks, which are implemented with a focus on virtual and digital applications. The approach is cooperative and takes into account the different contexts of the partners in terms of disciplines, technologies as well as expertise in data literacy. In a cooperative exchange with the project partners, the different background situations were identified, including the different disciplinary contexts, such as mathematics, data science, library and information sciences, and economics and social sciences.

The IO3 working group was established and processed the tasks of the subproject systematically and in a coordinated division of tasks. The responsible lead was shared by the project partners from Utrecht and Hamburg.

Task 1 consisted of a survey of existing infrastructure and resources (physical and virtual). This should make it clear which learning programs for data literacy are already known and in use at the universities. For this kind of as-is analysis a specific method and format was created based on the Business Model Canvas (Osterwalder 2010) and using the Open project management canvas¹ as a blueprint.

DaLiCo Learning Space Canvas Model was developed from this (description as further result).

¹ OpenPM Canvas, <https://www.openpm.info/display/openPM/Canvas>



The canvas is a structured form for project documentation. It includes a header section with fields for Project, Project ID, Projektmanager, and Version-Nr. Below this is a grid of seven boxes for different project components: Learner Segmentation, Learning Process, Data Literacy Competences, Space & Design, Data & Application & Tools, Management, Services & Hardware, and Stakeholder. The bottom right corner features a Creative Commons license logo and text.

Project:		Project ID:
Projektmanager:		Version-Nr.:
Learner Segmentation	Learning Process	Data Literacy Competences
Space & Design	Data & Application & Tools	Management
Services & Hardware	Stakeholder	

Die openPM Canvas steht unter einer [Creative Commons Namensnennung 3.0 Deutschland Lizenz](#).

Figure 1: DaLiCo Data Literacy Learning Space Canvas

Task 2 included a needs and requirements analysis involving the project partners. The results from research studies in IO1 were considered. According to the Ridsdale matrix the following competence areas were identified as competence needs by the IO1 study part 2: Data collection, Data management, Data application, Data evaluation:

Data collection

- Students identify needs for specific knowledge about search portals for data and they want to build up knowledge and more experience to formulate appropriate search queries for data.
- Students want to get deeper into data quality topics as how to evaluate quality and how to define criteria.

Data management

- Students lack knowledge about (research) data storage and data formats.

Data application

- Students are lacking experience of sharing research data and publication outside the university.
- Students admit that their knowledge about data citation is limited to knowing where to look up the standards.
- A need has been identified for the topics data ethics, data culture and critical thinking
- Students state that they have no experience in terms of „Evaluating decisions based on data“, but they have great interest to get a better understanding about.

Data evaluation

- Students put great effort on learning better use of Data tools like SPSS, Excel.
- For the BA thesis empirical methods are used, students experience this as a great challenge to cope with data evaluation; their experience is that they don't feel well prepared for this challenge.
- Students are interested to learn R as a programming language and tool to improve their data evaluation and visualisation knowledge" (Gläser / Spree 2020).
- In connection with the possible technical learning environments for the courses, a comprehensive analysis, including the use of a decision tool, was carried out to make the requirements for the learning platform more explicit.
- In general, the use of the Learning Management Systems (LMS) already established in the partner universities – as Moodle, Canvas, EdX – was confirmed, as they meet all essential requirements and represent recognized standard LMS platforms.

Task 3: The concept for the relevant content, components and didactical design for the data learning course was determined based on the results from the project tasks and the practical experience from the Summer Schools in 2020 and 2021. For this purpose Learning Outcomes were cooperatively discussed and fixed (see description as further result). Also, the concept of a data story was discussed and tested.

The IO3 Workshop "Data Literacy Learning Space", Multiplier Event 06.07.2021 is based on a conceptional approach (see further result IO3 Workshop ME2021)

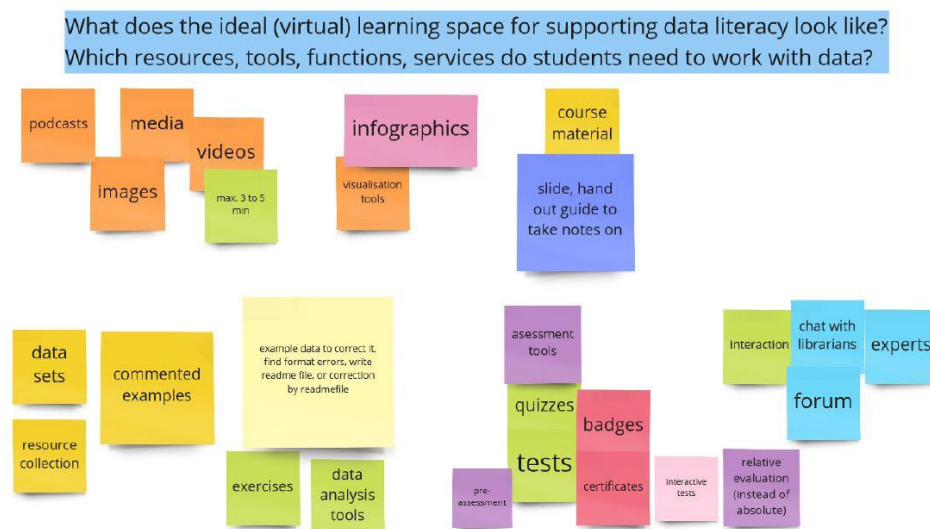


Figure 2: Result Workshop Data Literacy Learning Space, Multiplier Event 06.07.2021

Task 4: Prototypes of the virtual data literacy learning space are developed within the chosen LMS (Moodle, Canvas, EdX). The prototypes will enable transfer and adaptation to the conditions and requirements (technical and contents) of the partners by implementing technical web standards like H5P (HTML5) and SCORM (Sharable Content Object Reference Model).

Within Universitat Politècnica de València, students have the opportunity to complete their education with complementary MOOC courses (educational videos)offered through the edX platform <https://www.edx.org> or a local version <https://www.upvx.es> platform. On a regular basis, all university students receive credit in order to enrol and get certified courses through each one of these platforms.

The partner universities in Hamburg and Debrecen use Moodle² as Learning Management System (LMS) for their curricular courses. In addition, HAW Hamburg also offers with viaMINT a Moodle platform for extracurricular course offers. The viaMINT platform was chosen for the cooperative pilot of the data literacy course.



Figure 3: ViaMINT course

The Canvas LMS³ which is used by the partner university in Utrecht has standard features to serve as an LMS. This platform is used to test the transferability of the prepared course content (SCORM, H5P).

Task 5: Dissemination within project partner universities.

ViaMINT⁴ is an online learning environment, developed at the Hamburg University of Applied Sciences – with its video-based content for mathematics, physics, chemistry, and programming, it offers bridging courses for first semester students in STEM fields to close possible knowledge gaps between high school and university. With the viaMINT (Landenfeld 2018) platform at HAW Hamburg, a Moodle-based e-learning environment was chosen, that enables external registration (anonymous login) and technical features for didactical support of the content.

Therefore, the course content can easily be used within the HAW Hamburg but also from external students, for example from the partner universities by anonymous registration (https://viamint.de/auth/anonymous/anonymous_dialogue.php?).

² <https://moodle.org/>

³ <https://www.instructure.com/en-gb/product/canvas/higher-education/lms>

⁴ <https://viamint.de/>

Structure and Features

For the cooperative pilot of the data literacy learning space beforehand a structured analysis in terms of specific conditions and typical components of e-learning course was conducted:

organization/institutions	Primarily HAW and partner universities in the DaLiCo project, secondary external universities of applied sciences; Cross-curricular courses of study
learning culture	Project-oriented; working with real data, interdisciplinarity, integration of openness concepts
target groups	Independent learning students of all semesters and different disciplines; teachers
learning objectives / competencies	Definition of a uniform scheme: Learning outcomes are composed with the keywords (content and condition) and verbs from the pyramid of Miller and level two from Bloom to describe the behaviour (learning activity) we wish to see in a learning process. These three components will result in a performance that is measurable for a trainer as result. The colours blue , red and purple must all be identified within each outcome.
didactic model	<ul style="list-style-type: none"> • scenario-based (use-case) • list of sources (links, literature) • integrate OER • media diversity (text, images, video) • interactivity (tests, quizzes, ...) • work with real data • feedback function
resources for implementation	Virtual learning sites, if necessary for hybrid use <ul style="list-style-type: none"> • ViaMINT platform • Content contributions: project partners from Hamburg (HAM), Valencia (VAL), Debrecen (DEB), Utrecht (UT)
Contents (according to Ridsdale)	0. Introduction to data 1. data collection (HAM) 2. data quality (VAL, HAM) 3. data manipulation and analyse (VAL) 4. data visualization (UT) 5. decision making (VAL) 6. data ethics (VAL, UT) 7. data management (DEB)

The DaLiCo Dimensions were set up as a basic structure for the course, in order to be able to offer a holistic view of data literacy, to stress the underlying activities related to data literacy and to limit the topic areas in a meaningful way. For further information see DaLiCo Dimensions⁵ as result of IO1.

DaLiCo Dimensions

- Data identification
- Data use
- Data understanding
- Data reflexivity
- Data communication
- Data managing

The following screen shots illustrate different course content which is produced by the project partners and integrated into the cooperative viaMINT prototype course.

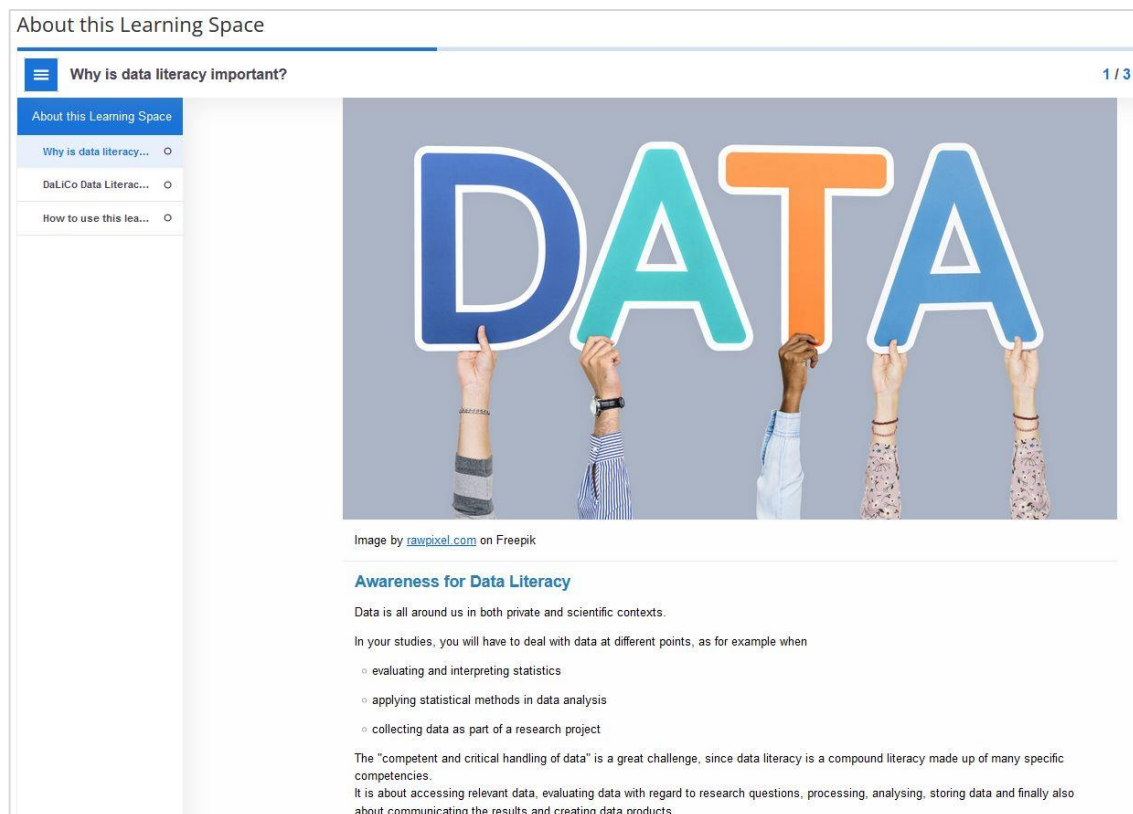


Figure 4: Course content for introduction of the learning space from HAW

⁵ <https://www2.bui.haw-hamburg.de/tematres/vocab/index.php?tema=1967&/dalico-dimensions>

Clean: Data Quality and Preparation

The screenshot shows a video player interface. On the left is a sidebar with a menu titled 'Video - Data Preparation' and a list of video topics. The main area displays a video player with a presentation slide. The slide is titled 'Data Preparation' and 'Data cleansing'. It features two colored boxes: an orange box for 'Integrity' and a green box for 'Consistency'. The 'Integrity' box lists 'Completeness: Comprehensive representation of the problem' and 'Validity: No constraints are violated'. The 'Consistency' box lists 'Schema conformance' and 'Uniformity'. A presenter, a woman in a maroon jacket, is standing on the right side of the slide, gesturing. The video player has a '4 / 7' indicator in the top right corner.

Figure 5: Course Content about data cleansing from UPV

Data Management: collect

The screenshot shows a webpage titled 'File formats' under the 'Data Management: collect' section. It includes a definition of file formats and a table titled 'File formats extensions for reusability/preservation:'. The table lists various file formats categorized as 'APPROPRIATE', 'ACCEPTABLE', or 'NOT SUITABLE' based on their suitability for reusability and preservation.

Type of data	APPROPRIATE	ACCEPTABLE	NOT SUITABLE
Tabular data with extensive metadata	.csv - .hdf5	.txt - .html - .tex - .por	
Tabular data with minimal metadata	.csv - .tab - .ods - SQL	.xml if appropriate DTD - .xlsx	.xls - .xlsb
Textual data	.pdf - .txt - .odt - .odm - .tex - .md - .htm - .xml	.pptx - .pdf with embedded forms - .rtf	.doc - .ppt
Code	.m - .R - .py - .jyph - .rstudio - .rmd - NetCDF	.sdd	.mat - .rdata
Digital image data	.tif - .png - .svg - .jpeg	.jpg - .jp2 - .tif - .tiff - .pdf - .gif - .bmp	.indd - .ait - .psd
Digital audio data	.flac - .wav - .ogg	.mp3 - .mp4 - .aif	
Digital video data	.mp4 - .mj2 - .avi - .mkv	.ogm - .webm	.wmv - .mov
Geospatial data	NetCDF, tabular GIS attribute data, .shp - .shx - .dbf - .prj - .sbx - .sbn - PostGIS - .tif - .tfw - GeoJSON	.mdb - .mif	
CAD/vector and raster data	.x3d - .x3dv - .x3db - PDF3D .pdf	.dwg - .dxf	

Figure 6: Course Content about data management from DEB

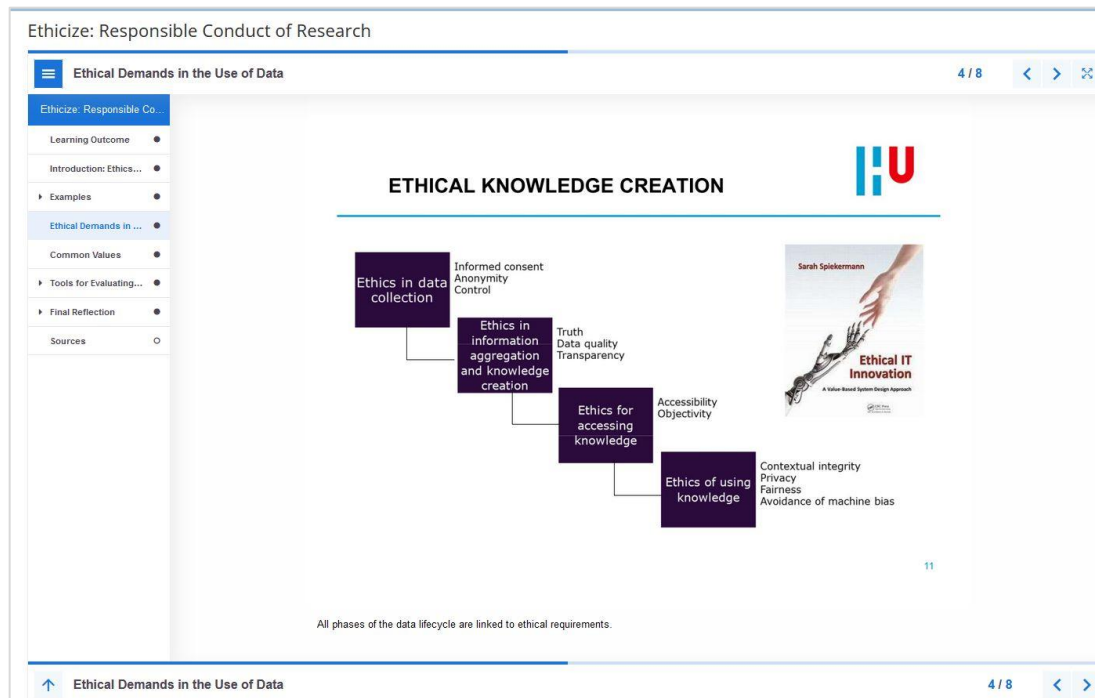


Figure 7: Course Content about Data Ethics from UT

Usage, Impact, Dissemination

Access to the course:

- <https://viamint.de/course/view.php?id=271>
- Anonymous Registration:
https://viamint.de/auth/anonymous/anonymous_dialogue.php?wantsurl=https://viamint.de/course/view.php?id=271

For monitoring use and user experiences a feedback function is implemented. The conditions of the partner universities are very different; therefore, the dissemination efforts are manifold.

Within HAW Hamburg, research studies have already been conducted within the faculty W+S (Economics and Social) as part of the DaLiCo project. It is planned to use the Learning Space in the context of curricular programmes of this faculty. Within the HAW faculty DMI (Design, Media, Information) at the department Information the implementation of the course within the work of the student Open Access Lab⁶ has started.

Furthermore, a cooperation with the International Office is intended to offer international students at HAW access to the course within the Digital Campus⁷. Dissemination via the OER portal Hamburg Online Open University (HOOU)⁸ is also connected.

⁶ <https://www.oa-lab.de/>

⁷ <https://www.haw-hamburg.de/international/gefluechtete/digitalcampus/>

⁸ <https://www.hoou.de/>

The supplementation of the course in the form of a German version of the contents is being examined and prepared.

Hogeschool Utrecht: In Utrecht we use the intellectual output as an alignment tool for data driven business within the intra curricula, e.g. people and business courses, and we intend to use parts of the content in our canvas platform for a course organisational behaviour. We also intend to develop a course in canvas with a SCORM module to viaMINT and EdX.

Universitat Politècnica de València: Students have the opportunity to attend some courses on excel for data management <https://www.edx.org/es/course/excel-gestion-de-datos>, an introduction to Power BI <https://www.edx.org/es/course/introduccion-a-power-bi-para-los-negocios> and an advanced course on machine learning and data science <https://www.edx.org/es/course/aprendizaje-automatico-y-ciencia-de-datos>.

Nevertheless, there is no basic course on data literacy nor data analysis, nor basic applied statistics that can help students to start working with data. So as to, the courses developed within IO3 can cover this gap. In some particular cases, such as it is the case of social sciences, such courses can be considered as cross curricular training courses to be recognized as training time within the PhD program (a minimum of 60 hours is required to be fulfilled by each student). More information can be found at:

<http://www.upv.es/entidades/EDOCTORADO/info/987894normali.html>

University of Debrecen and National Library: At the University of Debrecen, parts of the learning space are used in courses and trainings on research data management. DEB have developed a research data management course for PhD students within the curriculum, which focuses on various aspects of data literacy.

The content is linked to the results from IO2 for trainers of data literacy and thus also expanded in dissemination. More concrete linked to the Train the Trainer Handbook (IO2) and the DaLiCo modular online learning course (IO2).

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