

IO 1: DaLiCo Map Intermediate Report - Part 2

Author/s: Prof. Dr. Ulrike Spree – HAW Hamburg Prof. Christine Gläser– HAW Hamburg





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IO 1: DaLiCo Map – Intermediate Report

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AUTHORS Prof. Dr. Ulrike Spree Prof. Christine Gläser

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Results from Data Literacy Master Course in Hamburg

Introduction

Within the limits of lecturer guided student research projects, the participants of the master course "Open Science and Digital Literacy" (winterterm 2019/20) initiated an explorative research of data literacy education at the University of Applied Sciences Hamburg (HAW) from different perspectives. The idea was to explore the personal competence levels of learners (students) as well as the currently addressed competence level expressed within selected curricula of the University of Applied Sciences Hamburg. The research aimed at gaining first insights into the current expectations and experiences regarding topics and didactical aspects of data literacy education as well as to explore suitable methodological approaches to research and evaluate the current state of data literacy educations as well as future needs that in future can be adopted at the partner institutions. The main research questions were twofold.

Content level:

- What data competence needs are evident among students?
- What are the students' learning experiences within chosen data literacy programmes?
- What are the experienced learning and teaching levels?
- To what extent are data literacy topics presently integrated in accredited curricula (degree programmes as well as in extra-curricular activities (as well as infrastructure) of the HAW Hamburg?

Methodological level:

- Is the ethnographic approach inviting probands to create personal data literacy knowledge maps a suitable methodology to identify competence gaps?
- Is the methodology of personal data literacy maps applicable at the partner institutions in order to get a more complete picture of strengths and weaknesses regarding data literacy competences within the DaLiCo group?
- Are personal learning diaries an appropriate tool to probe student's learning experiences with online data literacy education tools?

Our subsequent approach is to map the personal (experience level of the learners) with the institutional level and to gather data on various aspects of DL (competencies, topics, emotional needs, learning styles). The data was collected applying a mixed method approach:

- Data literacy knowledge maps (personal level)
- Interviews with MA-students (personal level)
- Learning diaries documenting practical experiences and learning progress with data literacy ٠ programmes (personal level)
- Curricula analysis (organisational level)

The collected data was analysed applying a qualitative content analysis (based on Mayring 2014), this allowed for applying a mix of deductively and inductively generated categories.

For the purpose of a basic deductive structuring the Ridsdale matrix was used.

Needs analysis on personal level of students

Based on in-depth interviews with nine students of the MA Digital Communication a student research team explored how students assess their DL competencies. The results are presented along the categories of the Ridsdale matrix. Within a 'student hospital' setting the students work in a newsroom producing a 360° journal. Albeit with a focus on online journalism the students are trained in all aspects of digital communication (DiKo 2020).









Fig. 1. Results of student interviews mapped to Ridsdale (Gerhardt et. al. 2020, p. 8)

From their previous BA courses and especially the experience of working with data for their BA thesis the students report that they feel

- qualified to collect data via questionnaires and
- researching data online using different types of online sources like data bases and repositories for example Statistisches Bundesamt, Destatis, public authorities in Hamburg, open government portals (Transparenzportal Hamburg) (Becker et al. 2020, p. 5).

Their understanding of data collection is very focused on survey data and interviews. During the interviews the aspect of evaluating the quality of the collected data was not mentioned by the participants.

Regarding data management the students reported

- 'ethical' behaviour in respect of anonymization their data and considering privacy,
- the methods and tools of data storage ranged from USB, to commercial (google) and academic cloud services.

Regarding data evaluation the students are satisfied with their ability to evaluate/appraise data according to importance, credibility, relevance, controversialness, validity and point of view (Becker at al., p. 6).

In the perception of the student's data application is narrowed to the publication of research results. They report a deficit in publishing their results (data are not explicitly mentioned) and a need to overcome this deficit (Becker at al., p. 7).

Additionally, explicitly formulated needs were mentioned:

- Support in formulating research questions on the data,
- Getting access to appropriate interview partners and probands, need for a panel for test persons







Conclusion

The students' understanding of data literacy ist still charactericed by traditional skills of collecting data (e. g. survey data) and quantitative skills (i.e. statistics) of basic data analysis. There is an awareness and a limited use of tools like data wrapper. More advanced data science and artificial intelligence skills are not explicitly mentioned.

Slightly exaggerated, the student's attitude can be characterized as overconfident regarding their competency to intellectually penetrate 'their data' and at the same time overrating the need of 'tool training' e.g. learning applications like R. However, they are aware of the need of assistance and support in generating meaningful research questions. Students understandably describe and express their educational needs in a self-centered way based on their personal learning experiences (assignments prepared) and needs to successfully complete their course (what do I need to pass my exams). They overestimate their expertise regarding acting ethically and the ability of (critical) thinking. They express a huge need to 'learn the tools of the trade'.

Method: Data Literacy Knowledge Map

The master students in the module "Data literacy in open science" - an elective module in the master study programme IMB (information, media, library) (IMB 2020), a master programme in information, library and communication science - investigated their present data literacy competencies creating personal data literacy knowledge maps. Knowledge maps can be understood as graphical directories of existing individual and organizational knowledge assets (Agile Verwaltung 2019). This method was introduced to the students as a personal means to analyse the individual data literacy and to gain an overview of existing knowledge and skills and personal competencies. The students could decide whether they preferred to create an individual or a team map (teams of two). Through the process of analysis with the data literacy knowledge maps the individual levels of data competency were addressed. The students were prompted to use the terminology from the Ridsdale matrix to describe their knowledge and skills. The visual implementation of the structure was optional and left to the students' needs and creativity. The students gained an individual overview and identified strengths and weaknesses of their personal data literacy. Most participants perceived the creating of the map as a very useful tool to come to grips with their own data literacy competencies and to appropriate the - for them till then rather abstract - concept. The following two comments illustrate the students' appreciation of the method.

"They [knowledge map and Ridsdale Matrix] were a tremendous help in identifying one's own competences, understanding what one's state of data literacy is like, and also where strengths and weaknesses lie and where there is room for improvement." (Translation Christine Gläser)

"The competence map is according to my personal experience a very good, helpful, but also versatile method. First of all, it offers a very low-threshold and simple introduction to the topic data skills and a simple way of personally locating strengths, weaknesses and needs for improvement in relation to the different competences. [] Although the map is defined by the matrix and the categories appear rather as a rigid method, it is the exact opposite. Through its freedom of design it is very adaptive and independent of the type of user, whether he is more creative or more sober, scientific methodological approaches are preferred or a combination of both, everything is possible with this method." (Translation Christine Gläser)

As the clippings below from selected maps show the visualisations and approaches differed greatly from simple structured texts over mind map like presentations to more sophisticated approaches using images and graphics. Orientations along the data management lifecycle is recognizable as an organisational structure (prior to the assignment the students had been introduced to the Ridsdale matrix) in most of the provided maps.

Some students chose to focus on their already existing competencies whereas others tried to indicate competencies (green for existing and red for missing) and relate strengths and weaknesses.







The strengths and weaknesses differed as expected regarding fields of knowledge (usability testing, statistical analysis) and skills/competencies, data types (social media data, analytics data, survey data) as well as level of expertise.

Student described existing data analysis on basic level (quantitative) (basic Excel, SPSS) naming the used tools and qualitative (MAXQDA) and a couple of simple statistical concepts (outliers, correlations, chi-square)

Reported missing skills range from basic competencies like data conversion between formats to more sophisticated tasks like "judging decisions based on statistical evidence". One student mentions the identification of mistakes in automatically generated keywords. Concepts from data science like clustering, classification, machine learning were not explicitly mentioned in the maps.

The students framed their experiences along the tools and resources they had experience with so far, e. g. for data analysis (Excel, Knime, Python, Tableau, DataWrapper) and resources like repositories (Cloud services, GitHub; GitLab). Evaluating data quality from a statistical point of view.

Some students explicitly expressed a need to learn more about data culture, data ethics, data evaluation; one student deplored the lack of knowledge how to describe data quality and what criteria for data quality existed. They expressed the need for more examples of applications, stating lack of personal experience, critical thinking applied to data, development of concepts for analysis, to know when which type of visualisation is useful.

Data security, data healing, data storing as well as data citation and sharing were also identified as in deficit. Dealing with large amounts of data (the expression big data is not used), standards for metadata for data, data discovery, data storing, data management methods and tools.

Students express/describe data competencies along practical applications/uses. The main reference point is the bachelor thesis – which was to expect, because it was mentioned in the assignment before – as a starting point. Students apply examples from their prior occupation (user experience, marketing) or student job (online marketing) or internship (identifying mistakes in automatically mapped meta data).



Fig.2 Student DL map stating insufficient knowledge regarding data culture, data ethics, data sharing







Fig. 3 Describing competencies along tools and basic statistic concepts

- b. Datenkultur (Bewusstsein, Anwendung und Erfahrung fehlen)
- c. Datenethik (Bewusstsein, Anwendung und Erfahrung fehlen)
- d. Datenzitierung (Quellenangabe für Referat, normierte Datenzitierung)
- e. Datenteilung (Grundlagen Urheberrecht \rightarrow offene Fragen siehe 3e)
- f. Evaluieren von Entscheidungen basierend auf Daten (Anwendung und Erfahrung fehlen)

Fig. 4 Simple Colour coding to visualise missing competencies. The missing competencies in black (lack of application and experience)







Fig.5 Example for affectionately drawn map



Fig. 6 Presentation of Competencies along the data management life Cycle

Most of the aspects that can be found in some of the maps can be discovered in the example Sarah and Teresa created.

- The competencies are organized along the data management life cycle / Ridsdale matrix.
- Competencies are traced back to places/occasion where they were learnt (school, university).
- Applications and examples from prior experience either in the job or study programme (for example library field of practice¹ or online-marketing (log file analysis).
- Data management is described via the tools used (Excel, Augias)²
- Data application is only known from seminars. There is a lack of experiences of practical consequences of (good or bad) data practice as well as data culture.

² Mentioned Tools: DataWrapper, Excel, SPSS, GitHub, GitLab, DataViz, Tableau, Typeform, Survey Tools (Unipark), Google Docs, Google tables, Pica, MySQL Mentioned Tools: DataWrapper, Excel, SPSS, GitHub, GitLab, DataViz, Tableau, Typeform, Survey Tools (Unipark), Google Docs, Google tables, Pica, MySQL Mentioned Tools: DataWrapper, Excel, SPSS, GitHub, GitLab, DataViz, Tableau, Typeform, Survey Tools (Unipark), Google Docs, Google tables, Pica, MySQL





¹ only two other examples mentioned library science specific concepts and applications like metadata standards (RDA) or applications (PICA).



Fig. 7 Sarah and Teresa's map

To support the first impression regarding the student's needs we conducted a content analysis³. In the first step the documents were coded according to the structure the Ridsdale matrix offers. The code "Ridsdale DL requirements" is added inductively to mark parts of the document whenever a need was expressed by the students (see figure 8).

These datasets were then combined to focus on the dedicated Data Literacy needs according to the Ridsdale Matrix.

³ For the analysis the qualitative Data Analysis Software MAXQDA was used







9	Liste der Codes 💼 🍙 🖉 📾 🔎	₽≍							
18	D #								
×	- Codesystem	328							
	💙 🤨 Ridsdale	1							
	Ridsdale: tools/systems/technical issues	12							
	I Ridsdale: Conceptional framework								
	I.1 Introduction to data	3							
	 Ridsdale: Data collection 2.2 Evaluating and ensuring quality of data and source 								
	••• 2.1 Data discovery and collection	6							
	💙 📲 🖉 3 Ridsdale: Data management	5							
	3.6. Data preservation	3							
	Image: State of the security and re-use	4							
	3.4 Metadata creation and use	2							
	3.3 Data conversion (from format to format)	3							
	3.2 Data manipulation								
	3.1 Data organization	2							
	🗙 📲 🖉 4 Ridsdale: Data evaluation	7							
	• 4.7 Data driven decision making	2							
	4.6 Data presenting (verbally)	1							
	4.5 Daten visualization	10							
	• 4.4 Identifying Problems of using of data	1							
	••• 4.3 Data interpretation (understanding data)	8							
	4.2 Basic data analysis	8							
	• • • • 4.1 Data tools	9							
	S Ridsdale: Data application	30							
	Ridsdale DL requirements	26							

Figure 8: Extract of the code system for content analysis in MAXQDA

As a result from the content analysis of the learning diaries some tendencies can be stated, which are presented in the chart below and illustrated by examples from the diaries. The results are presented along the categories of the Ridsdale matrix.

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 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.







- For the BA thesis empirical methods are used, students experience it as a great challenge to cope with data evaluation; their experience is that they do not 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.

Conclusion

The students' needs address specific aspects of nearly all Ridsdale competence areas: data application, data management, data collection and data evaluation. The results correlate with the already presented analysis results on data literacy on a personal level.

Method: Learning Experiences with Data Literacy Education Programmes

The students reflected in pairs their data literacy knowledge maps to discover the needs and requirements for further data literacy training and support. Subsequently the students chose (individually or in teams of two) seemingly adequate data literacy learning materials to remedy the observed deficits. They were free to choose from either taking trainings or tutorials or to explore data tools. The students analysed and reflected the way in which the applications supported overcoming data literacy deficits in the form of writing learning diaries.

When giving the assignment the format of the diaries was left open on purpose as we were interested in finding out on what aspects the students themselves would focus.

Overall, in their diaries the students put a focus on the general design of the course (learning pace, example based ...) and the applied media.

The content analysis of the learning diaries revealed the main experiences. These codes were created inductively by analysing the texts from the learning diaries referring to positive and negative learning experiences while practicing the chosen courses and programmes.

	Liste der Codes	à	6	٣	 æ	۶	₽≖×
增					D	#	^
	 DLE - Learning experiences 						1
	gamification						1
	• communication						2
	Iearning type						5
	Indistic DL						1
	👓 media mix						6
	• • • • • • • • • • • • • • • • • • •						13
	• self control / self paced learning						14
	• practical exercise						16
	real data						11
	context BA thesis						5
	V 🔮 Bloom						3
	Evaluation						2
	 Synthesis 						1
	Analysis						8
	 Application 						14
	 Comprehension 						20 🗸
Fig	9: Code book learning diaries						

Fig. 9: Code book learning diaries

Learning experiences with similar content were clustered and assigned to the codes. The main elements of the categories were summarised and described below.

DLE - Learning experiences\practical exercise





Application and practical examples were rated as helpful - through practical application the knowledge is better memorized. If practical examples are explained illustratively the input appears more varied and also more applications-oriented and therefore usable. Projects help to consolidate what has been learned.

Didactical design which is important for students:

- after each theoretical input there are mandatory tasks, that you cannot continue without solving them
- assistance is offered for tasks
- case studies and quizzes are perceived positively
- the direct integration of e.g. a code editor or programming environments provide interactivity and fun while learning.

DLE - Learning experiences\self control / self paced learning

The course units' structure is addressed. Text and video options allow an individual selection of learning media. The order of the course units can be changed. The possibility of individual time management responds to the different previous knowledge and learning pace of the students; it allows pausing and making notes.

Overview page (dashboard) facilitates control as to get insights into the course scope and learning status. The integration of feedback mechanisms is considered to be helpful. Motivation and confirmation is supported through learning successes with application and examination tasks.

Positive experiences with control functions: "The videos can be stopped, fast-forwarded and rewound and the volume can be adjusted. You can also turn on subtitles, adjust the speed (0.25-2.0)."

In sum: the students appreciate all functionalities that allow flexibility and freedom but at the same time offer some guidance and orientation.

DLE - Learning experiences\usability/didactical structure

Explanatory video and precise explanation are helpful, as overview pages are. Step-by-step instructions are adequate to increase confidence.

The provision of structure is important. (Examples for comments "The course units are well structured. There is a survey at the beginning and end of each subunit (Poll) as well as a discussion about the learning status."

Students also describe positive experiences with appealing and understandable layout and good visualization of graphics. The general handling has to be easy. Negative experiences are reported with completely overloaded slides.

DLE - Learning experiences\real data

In the exercises we always worked with real existing data sets, this makes it illustrative for the students. A variety of data is positively mentioned. Everyday examples and case studies are appreciated very much. Students report strong emotional reactions like surprise and anger in connection with these examples.

DLE - Learning experiences\media mix

Multimedia is experienced positively, the combination of reading texts, graphics, surveys and explanatory videos provides a good media mix.

The use of media, such as videos or pictures evoke positive emotions like joy.

DLE - Learning experiences \learning type

Students make very different experiences depending on their own learning type (auditory, visual, communicative). Students were encouraged to reflect on their learning styles.







A variety of media channels in the courses supports the flexible adaptation for the students. The teaching concept should thought out well and appropriately prepared for a variety of learning types.

DLE - Learning experiences\context BA thesis

Basic knowledge in statistics is available from the former BA studies but the ability to apply statistical methods to new tasks and research questions is limited according to the students' experience.

DLE - Learning experiences\communication

Offers for forums or news and the providers were rarely used by the students.



Figure: 10 Clustered topics of students' learning experiences

Conclusion

The diaries offered instructive insights into students' value systems and criteria for judging learning and teaching material. Interestingly the students did not apply specific criteria for learning data literacy but applied general criteria for 'good' learning experiences, a lot of them in line with general usability principles regarding interaction principles (like self-descriptive, discoverable, explorable, gives feedback, controllable, error robust, prompts user engagement) as well as principles for presentation (consistent, freedom from distraction) (DIN EN ISO 9241-112:2017; DIN EN ISO 9241-110:2019)

The students expressed a need for applications-oriented material (in their wording they want the learning experience to be 'practical' (= useful and meaningful for them) and not 'theoretical' (= abstract knowledge not related to their personal lives). Hence projects offering context and using real data were relevant aspects for the learners. Students consider self control and a clear didactical structure within the learning programme as very important.

While writing the diaries the students experienced and documented the huge effect of emotions on how pleasant they experienced the learning activity as well as the success. Variety and playfulness grant positive experiences. However, irrespective of the approach the chosen learning material took (project based, problem oriented, guided practice (Koch, Wilson 2016) all diaries reported a kind of deadlock describing the difficulty of adopting and transfering the newly learned facts, skill, theories, when they realized that the 'it started somewhat simple and then it suddenly got complicated, difficult'.

Regarding content introductions into data management procedures (for example regarding research data management), applying tools that combine basic coding (R, Python) with statistical manipulations and analysis were seen as pertinent for data literacy education. The previous knowledge rarely excels basic statistics.

The students' main learning experiences can of course be explained with reference to existing learning theories (Koch, Wilson 2016). For the further work within DaLiCo they demonstrate a number of important aspects:

• Taking into consideration the learners / teachers perspective is a prerequisite for every successful activity.







- Learning diaries or any other tool that prompts learners to reflect how they learn are very supportive for competency building. Bloom's taxonomy of levels for educational learning objectives was introduced to the students as a methodical approach for their reflection. The students analysed the data literacy tools and courses according to the levels of Bloom's taxonomy and identified a strong emphasis on the first three levels "Knowledge, Comprehension and Application". Content and elements which refer to the higher levels of learning objectives like "Analysis, Evaluation and Synthesis" were only to a small proportion part of the programmes.
- Knowledge was transferred on different channels like text, visualisations or videos. The level of "comprehension" was addressed by didactical formats like examples and quizzes. "Application" was realized by exercises as e.g. for programming (Jupyter Notebooks). Concrete problems were solved on the basis of practical data sets.



Figure: 11 Bloom's learning level in the learning diaries

The connection between the identified levels of Bloom's taxonomy and the students' learning experiences reveals interesting results. The learning experiences were reported as very positive (also emotionally) when they refer to the more elaborated levels of Bloom's taxonomy starting with "application" up to "synthesis".

For the teacher they grant the opportunity to change viewpoints and perspectives. DaLiCo partners need to strengthen this aspect and make it visible through the DaLiCo map.

Method: Exploring teaching of DL competencies in selected resources at HAW Hamburg

Analysis – approach:

In the first step selected curricula of current MA study programmes at the University of Applied Sciences Hamburg were analysed (subsequently the collection of data-literacy resources and activities at HAW Hamburg should be expanded to a variety of materials. This may includes curricula, teaching materials (especially already existing repositories like ViaMint (https://viamint.haw-hamburg.de/) and HOOU (https://www.hoou.de/), courses and trainings, but also higher education institutions, experts, networks and labs.

For the exploratory research the collection was focused on the domains of health and governmental data. As part of the analysis, course descriptions and material of 14 bachelor and master courses were identified. For this purpose, five departments were selected that have a connection to health and governmental data.

- o Department of Health Sciences
- o Department of Care and Management
- Department of Business Engineering
- o Department of Public Management
- o Department of Social Work







In addition to the course descriptions, five recent theses from each of the departments mentioned above were examined in terms of data-literacy competences. Attention was paid to whether and how the research was done with data and what quality the collection and analysis of the data has.

Analysis – structure

Criteria for structured analysis:

- Classification of Course description according Ridsdale Competence Matrix and Bloom's • taxonomv
- Identification of data literacy topics, tools and application example

Analysis – Results:

Again, applying the Ridsdale Competence matrix, categories and subcategories it is noticeable that some categories are represented much more frequently than others. Especially the categories of data evaluation are frequently represented. Data storage, data application and data citation are not mentioned in any of the module manuals.

Regarding the Bloom's taxonomy of learning goals, the results of the analysis show that "Apply" was the most common learning goal according to Bloom's taxonomy. This is followed by analysis and knowledge.

Topics, Tools:

In the majority of cases no tools are mentioned. With ten mentions, SPSS is most often mentioned in connection with data literacy. Most often, data literacy is taught in the context of seminars whose goal is to teach methodology.

Bachelor and Master theses:

The analysis of the theses shows that the students of the selected departments applied data literacy competencies in particular in the Ridsdale subcategories "basic data analysis", "data interpretation" and "data visualisation".

Results and discussion

The analysis offered a variety of relevant approaches (curricula, course descriptions, theses, etc.). The methodological approach is appropriate to be applied in the context of the DaLiCo partners. The results support and underline the results from analysis of students' personal level of data literacy (for more details we refer to Doß, Heibel, Hernandez, Strehlow 2020).

Conclusions

From needs analysis, practice with data literacy map, data literacy learning diaries and analysis of curricula

What data competence needs are evident among students?

Requirements / needs at nearly all competence areas of the Ridsdale matrix were detected:

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.

 \rightarrow The topics that were particularly highlighted should be particularly considered in the future work in the IOs of the DaLiCo project.

What are the students' learning experiences within chosen data literacy programmes learning and teaching levels (Bloom) were addressed?

The diaries offered instructive insights into students' value systems and criteria for judging learning and teaching material. Interestingly the students did not apply specific criteria for learning data literacy but applied general criteria for 'good' learning experiences, a lot of them in line with general usability principles regarding interaction principles (like self-descriptive, discoverable, explorable, gives feedback, controllable, error robust, prompts user engagement) as well as principles for presentation. The learning experiences were reported as very positive (also emontionly) when they refer to the more elaborated levels of Bloom's taxonomy starting with "application" up to "synthesis".

ightarrow the results of the study with data literacy programs show that there is a clear need

- for applications-oriented material (in their wording they want the learning experience to be 'practical' (= useful and meaningful for them) and not 'theoretical' (= abstract knowledge not related to their personal lives). Therefore projects offering context and using real data were relevant aspects for the learners.

- for integrating higher levels of learning objectives like "Analysis, Evaluation and Synthesis" into education concepts for DL

To what extent are data literacy topics presently integrated in accredited curricula of the HAW Hamburg?

Especially the categories of data evaluation are frequently represented. Data storage, data application and data citation are not mentioned in any of the module manuals. Regarding the Bloom's taxonomy of learning goals the results of the analysis show that "Apply" was the most common learning goal according to Bloom's taxonomy. This is followed by analysis and knowledge.

 \rightarrow The results highlight the need for the integration of data topics, as they show that beyond statistical data analysis there are many "vacancies " to be found in the curricula.

Findings at the methodological level (data literacy maps, learning diaries, curriculum analysis)

 \rightarrow The methodological approaches of the study led to relevant results for the project and give inspiration for methodological approaches that can be adopted by the DaLiCo-partners (needs and curricula analysis, competency maps, learning diaries).







Resources

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