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Learning Information Literacy across the Globe. Frankfurt am Main, May 10th 2019

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Alexander Botte – Paul Libbrecht – Marc Rittberger (eds)

Learning Information Literacy Across the Globe

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Information literacy (IL)
as a learning process

Digital learning resources
for IL (e.g. MOOCs, scenarios, OERs)

Cultural diversity of information literacy

Information-literacy in connection
to other literacy concepts

DIPF
Bildungsforschung
und Bildungsinformation

Information Literacy Online

Contents

(presentation, movie recording)

Foreword

The international Conference on Learning Information Literacy across the Globe was held on the 10th of May 2019 at Frankfurt Main, Germany. The Conference was part of the Erasmus+ Project Information Literacy Online (ILO), a European project to improve students' competencies. The Conference recorded about 50 visitors from Austria, Croatia, Germany, Hong-Kong, Italy, Slovenia, Spain, the Netherlands, United Kingdom, and United States.

In November 2016 the EU project ILO was started with the aim to develop, evaluate and disseminate a multilingual open access online course (MOOC) designed to improve students' abilities to cope with the claims of present-day information society. In May 2019, the seven partner institutions were able to present a MOOC on Information Literacy, covering six language and cultural areas. An integrated assessment component enhances the autonomous learning progress.

The Conference task was to be a forum for the exchange of research and experience associated with Information Literacy (IL) Learning. Besides three keynotes and a panel four paper sessions with altogether twelve presentations took place. Twenty three papers had been sent in for peer review.

Two additional workshops were attached to the Conference, but they are not part of this documentation.

With different frequency, the following topics are touched by the keynotes and papers:

- Information literacy as a learning process, including assessment
- Digital learning resources for information literacy (e.g. MOOCs, Learning-scenarios, OERs)
- Comparative studies of courses and curricula with an information literacy lens
- Cultural diversity of information literacy
- Information literacy in connection with other literacy concepts

This digital book of proceedings covers mainly the full text publications of all the positively reviewed papers. Secondly, the three invited keynotes can be followed by film recordings and partly PowerPoint Presentations as well as by live sketchings.

A documentation of the Conference has been published on the website since June 2019.

Marc Rittberger, Paul Libbrecht and Alexander Botte

Frankfurt am Main, January 2021.

Special thanks go to our Board of Reviewers, the Programme Committee:

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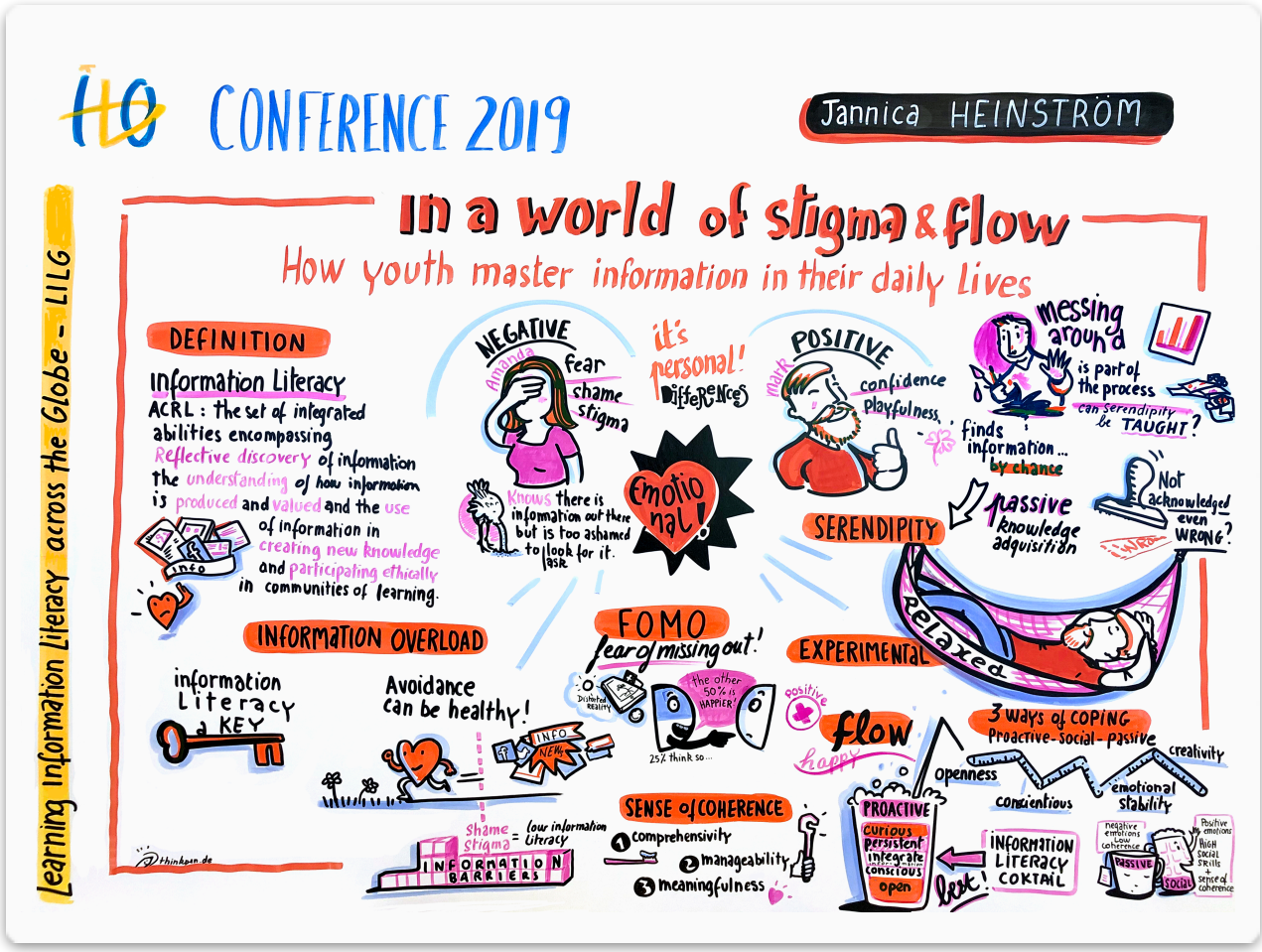
In a world of stigma and flow
- how youth master information in their daily lives -

Jannica Heinström

Åbo Akademi



This talk discussed how young people naturally use information as part of their daily lives. It particularly emphasized emotional aspects and ask why young people may choose to either actively engage in information interaction or withdraw from it. Individual patterns of information interaction have been related to personality traits and sense of coherence. The talk highlighted phenomena such as stigma, information avoidance, fear of missing out, serendipity and flow. The talk concluded with a discussion of a holistic under-standing of everyday information mastering, as including both cognitive, behavioural and emotional aspects.

The keynotes and panels are not available in printed full text. They can only be followed by the movie recording which can be accessed at informationliteracy.eu/conference/ .

Concept and development of an Information Literacy Curriculum Widget

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Abstract. Information literacy, the access to knowledge and use of it are becoming a precondition for individuals to actively take part in social, economic, cultural and political life. Information literacy must be considered as a fundamental competency like the ability to read, write and calculate. Therefore, we are working on automatic learning guidance with respect to three modules of the information literacy curriculum developed by the EU (DigComp 2.1 Framework). In prior work, we have laid out the essential research questions from a technical side. In this work, we follow-up by specifying the concept to micro learning, and micro learning content units. This means, that the overall intervention that we design is concretized to: The widget is initialized by assessing the learners competence with the help of a knowledge test. This is the basis for recommending suitable micro learning content, adapted to the identified competence level. After the learner has read/worked through the content, the widget asks a reflective question to the learner. The goal of the reflective question is to deepen the learning. In this paper we present the concept of the widget and its integration in a search platform.

Keywords: Information Literacy · Micro Learning · Reflective Learning.

1 Introduction

Information literacy and the access to and use of knowledge are becoming a precondition for individuals to actively take part in social, economic, cultural and political life in societies of the 21st century and must be considered as a fundamental competency in our digital lives. The UNESCO considers it a basic human right [9] while the American Library Association (ALA) [1] calls it a survival skill in the information age.

In general, the concept of information literacy is widely unknown outside the information science community, although, there is a need in society to educate citizens to become digitally competent. The European Commission deems the gain of skills and competences w.r.t. information literacy necessary and offers a

tool to assess and improve citizens' digital competence by developing the European Digital Competence Framework for Citizens (DigComp 2.1) [8]. Therefore, the education of professionals to become data-savvy with regard to information literacy becomes more and more important.

In this work, we will present a concept of a widget and its implementation in a newly developed search platform that provides automatic learning guidance with respect to three modules of the DigComp 2.1. framework. The goal of the automatic learning guidance widget is to raise the learners competence level for each competence to the expert level. Furthermore, we base our work on micro learning in combination with reflective learning, which we both see as two complementary learning strategies that support learning on the fly while using the search platform.

The main contribution of this work is to provide

- a newly developed learning approach by combining micro learning with reflective learning based on open learner modelling.
- a newly developed concept that automatically tracks the learner's learning progress in order to provide guidance adapted to the learner's competence level and learning needs w.r.t. the curriculum.

As this work presented here is currently work in progress, there was no evaluation conducted so far. However, a previous work discussion challenges on providing automatic learning guidance can be found in [13].

2 Related Work

In this paper, we are interested in technology implemented in a newly developed search platform that provides automatic learning guidance with regard to an information literacy curriculum. As the cognitive load while searching is typically very high and is concentrated on the information need, we will follow a micro-learning approach that offers the learning content bit-by-bit. For guiding learners through the curriculum and motivating learners to reflect about the micro learning content of the curriculum, we use prompts as proactive interventions and challenges. Additionally, we also relate to open learner modelling literature in the sense that micro learning content and reflection guidance technology is embedded in a search environment; thus all activities conducted on the platform with regard to these learning activities will be tracked, collected and stored in order to keep the skill and competence acquisition of the learner updated, and to store insights gained through reflection (if entered in the system). Finally, we conclude the related work section with a re-statement of this papers contribution in the context of such related work, and a statement of research questions.

2.1 Information Literacy

In societies of the 21st century information literacy and the access and use of knowledge are becoming a precondition for individuals to actively take part in social, economic, cultural and political life. Information literacy (IL) today, rather

than being a specialized skill-set, must be considered a fundamental competency like the ability to read, write and calculate. IL is so important for social development that UNESCO even regards the acquisition of this competence as a *a basic human right* [9]. Likewise, the American Library Association (ALA) (2006) [1] calls information literacy a *survival skill in the information age*. Digital competence, the confident and critical use of ICT tools, is equally vital for social and economic participation [27]. Today, when information is available primarily in digital and web-based environments, information literacy and digital literacy necessarily complement each other. Therefore, the European Commission developed the European Digital Competence Framework for Citizens, also known as DigComp [27]. DigComp 2.0 encompasses the main components of Information Literacy and parts of Media Literacy and was in version 2.1 extended to eight proficiency levels and use examples applied to the learning and employment field.

2.2 Micro-Learning

Within the area of mobile devices and new web technologies, new ways of learning and knowledge acquiring emerge. Typically, people use the web to enhance their learning in a formal learning setting like for example looking for further learning material or resources. In addition, the technological development of mobile applications offers new learning opportunities in a ubiquitous way, thus learning will be possible anytime and anywhere. Therefore, novel informal learning methods like micro learning become more and more convenient. The cognitive load of learners as well as professionals is typically very high, thus, we will follow a micro-learning approach, because *"micro-learning does not demand separate learning sessions"* [4], but it can be easily integrated into other activities of a learner, like for example searching. Micro learning *has been defined as small units of learning intended for application and paired with a learning objective as a step toward a larger goal, easily accessed by learners, therefore, often associated with device learning, and retrieved through tags and keywords* [22]. *"Micro-learning refers originally to taking short-term-focused learning activities on small learning content units"* as stated by Kovache et al. [21]. Both definitions are in line with our plans to use the micro-learning while conducting a search. By transferring micro learning into a search platform, *learning becomes more accessible anytime and anywhere, ubiquitous, just-in-time and on-demand, adaptive and learner-centric* [23]. Therefore, the content of the information literacy curriculum will be split into small bits that can be consumed bit-by-bit by using micro learning cards.

2.3 Reflective Learning and Reflective Prompts

Reflective learning is the conscious re-evaluation of past experiences with the goal to learn from them. This is in line with the definition of Boud et al. [3], who define reflective learning as *those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations.* Beside other technologies that can initiate reflective learning,

so-called reflective prompts have been shown to be a good way to technologically initiate reflective learning [12, 14, 11, 10]. We understand a reflective prompt as an intervention that motivates a user to reflect by presenting a small text message. These prompts often consist of a question, sentence starter (e.g."What I am thinking about now is...") or a direct instruction strongly connected to the users activities or context. The goal of prompts is to focus user attention on relevant aspects or experiences of their learning and working activities. In learning management systems, prompts emerged to be a viable and appropriate approach for guiding and initiating reflective learning [11, 16]. Here, prompts are used very often to organize, retrieve, monitor or evaluate knowledge as well as to reflect on students learning [16, 2, 18, 28]. Another approach that is presented in Kocielnik et al. [20], who use a conversational system that stimulates reflective learning on personal sensed activity data tracked with a fitness tracking application. Their approach was to send daily messages consisting of a visualization regarding the tracked fitness data in combination with a two-step mini-dialogue structure to make the reflective conversation engaging and to encourage a deeper level of reflection. Important to note is that all approaches presented can be seen as data-driven reflective learning approaches which leads to the idea to also use learning activities conducted in a search environment as a baseline for reflective learning. One major challenge that needs to be considered with regard to prompts is the right timing in the sense of not interrupting the user, as the right timing of a prompt affects the learning outcome [26]. To reduce the stress of interruptions through prompts on mobile devices, Ho and Intille [15] presented prompts directly after the completion of actions, while Pejovic and Musolesi [24] identify opportune moments for interruption by classifying relevant sensor data for context recognition.

2.4 User Models

User models are models that computer systems have about their users. In learning systems, user models often contain information about users like *knowledge, interests, goals, background and individual traits* [5]. Learning management systems typically use such models to adapt their behaviour or information representation to the user. In this case the user model need not be accessible by the user. In contrast, if users are allowed to access their user model in a learning management system, then they are called open learner models. Providing this access allows the users to see what the learning systems knows about their knowledge, and use this as basis for reflecting on their learning status and progress, and to plan further learning activities [6, 7, 17]. Relating such open learner modelling to Boud et al. [3], the learner models content represents the learning experience. In learning settings, the learning experience is the object of reflection, i.e. what the learners reflect on. In this sense, open learner models are similar to what the applications do, when reflection guidance technology is embedded: they collect information about a user activity, and represent it to users as a basis for reflection.

2.5 Contribution and Research Questions

Based on the literature presented above, we have designed a concept for a widget to provide automatic learning guidance w.r.t. the information literacy curriculum. The widget itself is implemented in a newly developed search platform aiming at increasing the learner's competence level to an expert level w.r.t. three modules of the curriculum.

As the cognitive load while performing a search is rather high, we have used a micro learning approach as underlying learning strategy. From reflective learning prompts we know that the timing when to motivate to reflect plays an important role, thus we coupled the timing of the reflective prompts to the learning activities of the learner on the platform. All learning activities, that are related to the curriculum like for example reading a micro learning content for pursuing the curriculum or answering a reflective question are stored in a learner model to keep track of the learner's learning progress.

Thus, the contribution of our work is to combine two different learning strategies: micro learning and reflective learning. We use micro learning to help users to learn small and feasible bytes in order to smoothly deal with complex content. We amplify this micro learning to support and deepen the assimilation and accommodation through reflective learning. In order to be able to apply this approach we need to be able to automatically infer the learning progress of the user in order to be able to present the right information w.r.t. learning to the user. While this challenge was already discussed in our previous paper [13], in this work we focus on the combination of micro learning and reflective learning.

Thus, we have defined the following research questions as further guidance for our work.

- RQ1: How need the interplay between micro learning and reflective learning be designed in order to effectively support the accommodation and assimilation of the learning content?
- RQ2: How need the reflective prompts be formulated that they are strongly related to the micro learning content and that they can be understood, are perceived as appropriate w.r.t. the users expertise, and lead to reflection;

These are the research questions that we would like to have answered within our approach, however, we have not conducted any evaluation with regard to the widget so far.

3 Concept

In figure 1, we shortly present the concept the widget is based upon. In order to initialize the widget, the learner's competence status w.r.t the modules of the curriculum, including different competence levels per module, is extracted with a questionnaire. This status is stored in the user's user model. According to this status, the widget automatically recommends the user a learning prompt referring to a micro learning card covering a topic to further develop the user's

learning competence. In order to automatically track if a user is opening the recommended learning card and deals with the learning content, we have implemented an activity logging mechanism that automatically tracks the user's activities with the learning card (e.g. opening the card, clicking on the next button when having learned the topic). These activities are then used to automatically infer the further development of the learner's competences and are added into the user model again. To strengthen the learned content, the widget presents a reflective question according to the learned content. After having answered this (open) question, the widget presents the next content to learn. Furthermore, beside presenting the learning and reflective prompts mutually, the widget visualizes also the overall progress of the user w.r.t. curriculum, thus the learner can see his/her progress at one glance.

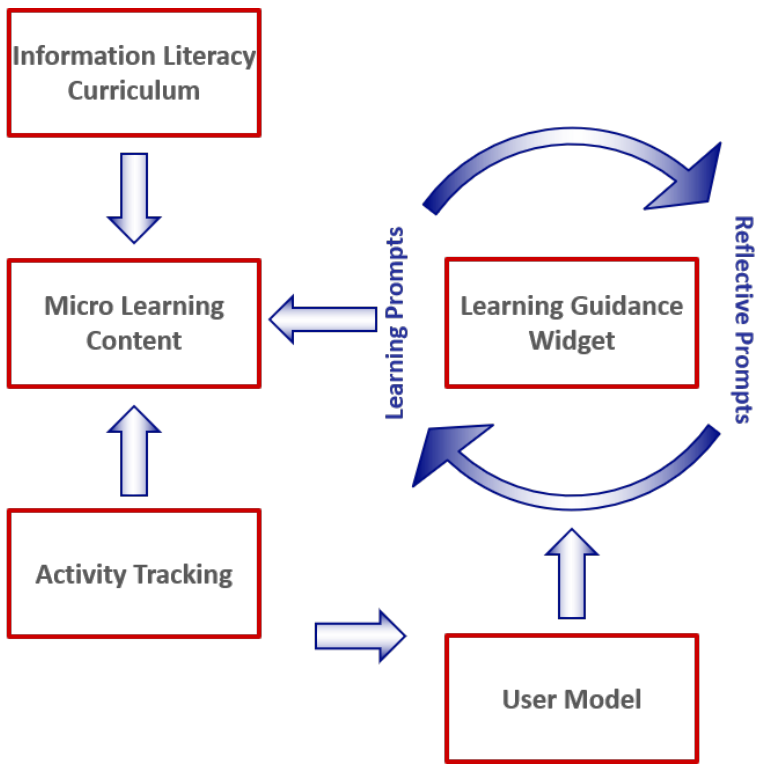


Fig. 1. Overall concept of the widget

4 Implementation of the Widget

In general the widget is implemented in the user interface of a search platform. It supports the acquiring of the following three modules of the DigComp 2.1 framework on three levels, namely, "Information and Data Literacy", "Communication and Collaboration" and "Content Creation".

The learning guidance widget consists of two parts, the *curriculum learning and reflection* part and the *overall progress part*. The curriculum learning and reflection part, figure 2 is divided into two areas. The upper area contains either a learning prompt suggesting to learn more about the next topic that would be the next in the current sub-module of their curriculum, and a button which

opens the respective learning unit in a new tab (see Figure2, a), or it presents a reflective question that motivates to think about the currently learned topic (see Figure2, b).

Regarding the prompts in more detail, both types of prompts are divided into prompts supporting three different expertise levels of users. Thus, depending on the competence status a user has like beginner, intermediate or expert, a corresponding prompt will be displayed. Thus, we have prompts for beginners, prompts for intermediates and prompts for experts. For example, table 1 shows three prompts for the sub-module "Finding Information" within the module "Information and Data Literacy" on three expertise levels.

Table 1. Example of micro learning prompts for the sub-module "Finding Information" in the module "Information and Data Literacy"

Level	Prompt
Beginner	Search tools are the various sources from which you can obtain information. Find out which there are and what you can use them for.
Intermediate	Would you like to know which strategies and tools you can use for your search? Click here for more information.
Expert	Do you know what search engines do if you search for information in a digital database? Find out more here!

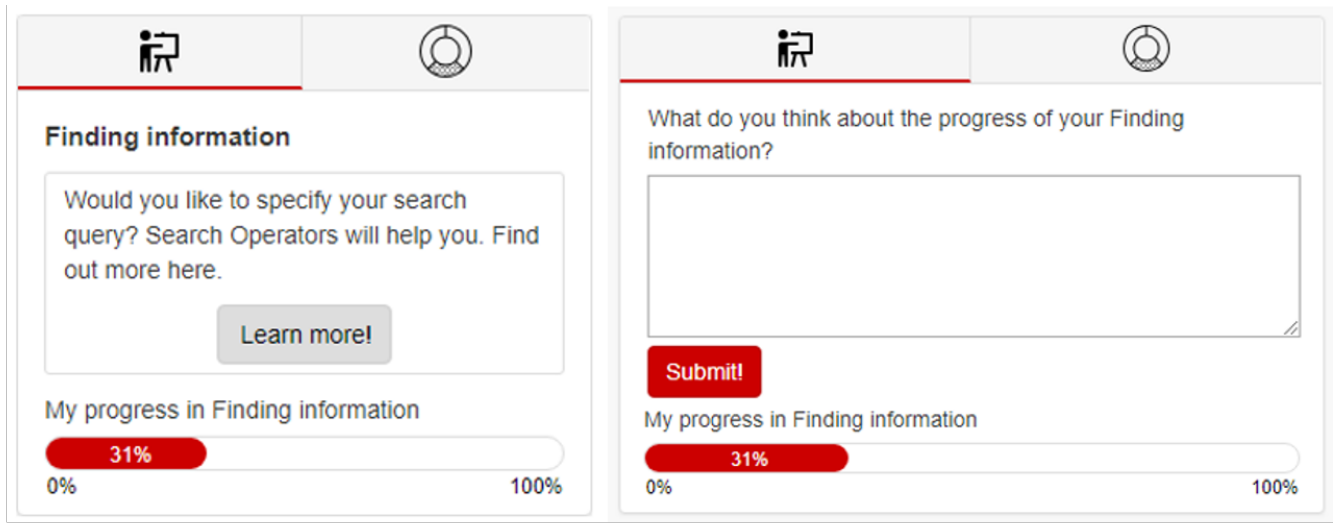
On one hand, the reflective prompts are strongly related to the topic of the micro learning content by taking up the content a learner has just learned. On the other hand, the reflective prompts were developed according the model of Kirkpatrick [19] and follows a specific goal depending on the learner's learning progress. Reflective prompts for the beginners level should make users aware of how they react to the learned topic e.g. if it was helpful for them. Prompts at the intermediate level make users aware to what degree learners acquire knowledge, skills, attitudes, confidence, and commitment and apply it in practice. Prompts on an expert level should motivate learner's to think about if they perceived a change or improvement in their work or study behaviour. Table 2 gives two examples for each level.

Below the prompts, a progress indicator shows the user the current progress for the curriculum's current sub-module. The progress is defined by the amount of completed learning units in comparison to the available ones for this particular sub-module, and matches with the progress in the overall progress widget for this specific sub-module.

The overall progress widget shows the user's learning progress with regard to the curriculum. In figure 3, it can be seen that the curriculum is divided into three modules, represented as sections in the inner circle of the visualization. Each module is additionally divided into three sub-modules (outer circle). Every time a user completes a new learning unit, the percentage in the respective section in the sunburst diagram gets updated. Furthermore, the progress in each sub-module is encoded by color. If the user has not completed any learning units

Table 2. Example of reflective learning prompts on three expertise levels

Level	Prompt
Beginner	What do you think about the progress of your finding information skills?
Beginner	What could help you to improve the finding information skills faster?
Intermediate	Could you already apply your newly gained knowledge about finding information and if yes, how? If no, why not?
Intermediate	What actions/motivators lead you to increase your learning about finding information this week?
Expert	How did your newly developed skill find information help you to improve your work/study?
Expert	How can you encourage yourself to continuously improve your finding of information?



a) Learning prompt to micro learning card b) Reflective prompt

Fig. 2. Learning prompt on the left side and reflective prompt on the right side.

in a sub-module (0%) the respective section will be red. Making progress in a sub-module will turn the section to yellow (50%) and finally, by completing a sub-module, the section will turn green (100%). This is also explained by the legend below the visualization. Moreover, the sections in the sunburst diagram are ordered to mirror the structure of the curriculum. Starting from the top, the sub-modules get completed clock-wise, slowly turning the visualization green.

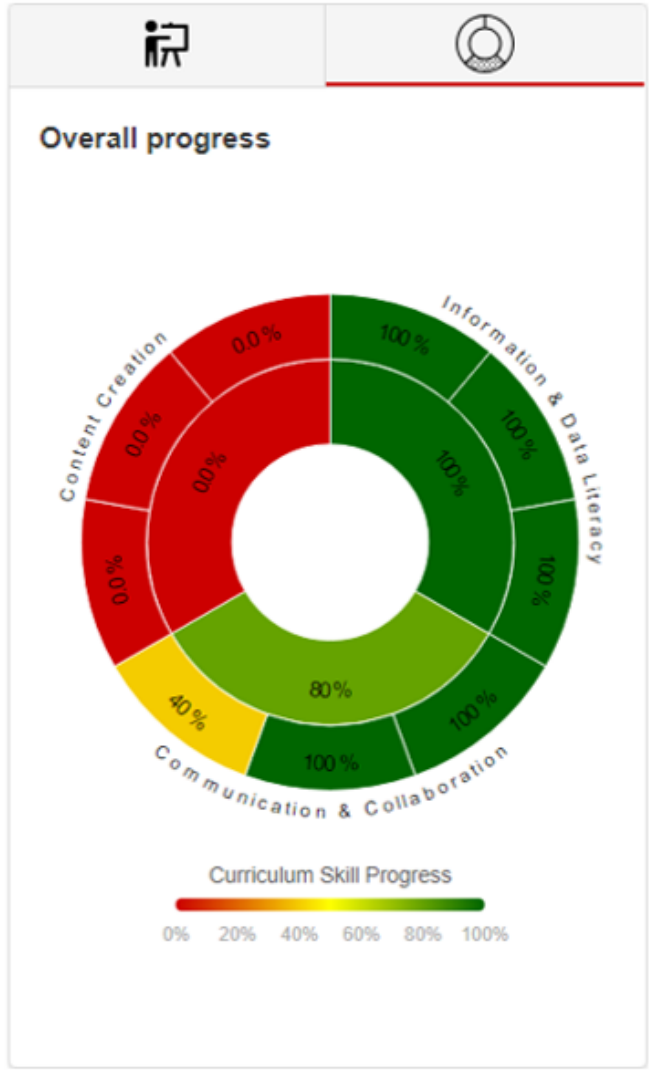


Fig. 3. Overall progress of the learner w.r.t. the curriculum.

5 Discussion

We will shortly discuss challenges and shortcomings according to our two research questions.

RQ1: Interplay between micro learning and reflective learning The advantage of a micro learning approach initiated through learning prompts are twofold: first, the content which should be learned is broken down into very small pieces and second, the cognitive load in our setting is still on searching and not on learning, however, it can be easily integrated in search activities [4]. Second, automatically guiding the learner through the curriculum according to the learners' learning progress and learning level ensures that the learner will cover all topics automatically and at the same time takes away the workload from the learner to find the next learning content to progress in the curriculum. Third, presenting the overall learning progress in one visualization can motivate the learner to continue.

Although reflective learning has been proved to be a very successful learning strategy, we are aware that the initiation of reflective learning with reflective learning technologies like prompts is still challenging. First, reflective learning is

a cognitive process based on the individuals intrinsic motivation and cannot be directly enforced. However, external impulses can be given to stimulate learners motivation [11, 10, 16]. Second, the timing of reflection is very challenging, thus, if a learner is disrupted by performing a search and perceives a prompt rather as disturbing than as useful s/he will not use it [14]. Third, the content of a prompt needs to be carefully considered, thus, it should be related to the user's context, in our case the learner's learning activities [20] in order to motivate for reflection.

By combining the two learning strategies, we try on one hand to use the advantages that micro learning brings along with the use of reflective learning prompts to deepen the assimilation and accommodation of knowledge, such as that we strongly relate the reflective question to the currently learned micro learning content.

RQ2: Design of reflection prompts: The design and formulation of the reflective prompts was motivated by the question on how to provide learner's a clear benefit for themselves as this is often difficult to achieve [25]. First, we strongly relate the topic of the reflective question to the content of the micro learning content in order to have a visible relation to current learning activities of the learner. Second, we built our question upon the model of Kirkpatrick [19], which is originally a model used for assessing training effectiveness in organizations using a 4-level approach for evaluating learning. By formulating the reflective questions according to the first three steps of the model ("Reaction", "Learning" and "Behaviour") we are aiming at improving the learner's self-reflection by starting with low-level reflective questions followed by questions to deepen the reflective learning.

We think that our approach is legitimate and well founded, however, only a well-planned evaluation will give us insights if this approach works.

6 Conclusion

In this work we have presented a widget for providing learning guidance along an information literacy curriculum based on the EU DigComp 2.1 framework that has been implemented in a newly developed search platform. We based our concept on the combination of micro learning and reflective learning, as we see these two learning strategies are perfectly complementing each other so that they support the acquiring of knowledge, and deepening the assimilation of it at the same time. Furthermore, we discussed challenges and shortcomings of our concept. As the next step, we aim to set up experimental field studies with university students in order to answer the above stated research questions.

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Analysing Informed Learning at Maastricht University

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Abstract. Learning and teaching should be at the forefront of innovation through the *informed* use of a wide range of evidence, contextualised to the specific circumstances of the institution and discipline. Maastricht University (UM) puts emphasis on analysing learning and important 21st-century skill development, such as information literacy skills. Informed learning is a distinct way to approach information literacy in that it addresses the functional, situated and critical nature of learning to deal with information. However, we have limited insight to what extent informed learning practices occur. The aim of the present paper is to answer the question how we can analyse informed learning at Maastricht University (UM) from a student and a teacher perspective. The present paper reviews several studies and these will provide input for an overall university-wide project (Title: Information-Wise) about integrating information literacy as part of problem-based learning at UM.

In conclusion, these are the five most important recommendations for UM regarding analysing informed learning: 1) Analyse to what extent the functional, situated, and critical approach of informed learning are practiced with a mixed approach. 2) Quantitatively analyse the issues related to information use within the learning process in a student population by using surveys and the perception of these issues in a teaching staff population by using surveys. 3) Qualitative analyse how students and teachers deal with information in the learning process by using focus group. 4) Quantitatively analyse to what extent intended learning outcomes in course manuals meet information literacy standards. 5) Use both formative and summative assessment to measure information literacy skills and include the four levels of assessment [1], including level 4 (Results). This level 4 of measurement considers the big picture and long-term effects of instructions and should be taken into account if UM wants to have an impact of student learning beyond graduation regarding information literacy skills.

Information-Wise is a university-wide project aiming to identify and develop information literacy skills, which enable students to actively participate in the changing information environment. By collecting these data, we intend to increase the awareness regarding information literacy as part of the learning process for both students and teachers. In addition, these data will provide input for developing and tailoring generic and discipline-specific information literacy education at UM. During the conference on Learning Information Literacy across the Globe the first preliminary results of the overall project will be presented.

Keywords: Informed Learning, Information Literacy, Analysing Learning

1 Introduction

Learning is the process of acquiring new, or modifying existing, knowledge, behaviours, skills, values or preferences [2]. Learning how to learn is an important skill, as it is crucial in order to deal with high levels of uncertainty to adapt to new circumstances within the current society. Teaching staff, in collaboration with, instructional designers or instructional systems designers create instructional experiences which make the knowledge and skills acquisition more efficient, effective, and appealing [3]. The process of instructional design consists of determining the state and needs of the learner, defining the end goal of instruction, and creating some "intervention" to assist in this transition. However, the current models, frameworks, and approach to understand learning in higher education seem rather inadequate. As Laurillard [4] notes, "Academics have ambitious definitions for student learning. When asked to define the nature of learning in their subject area, they produce descriptions of high-level thinking, such as 'critically assessing the arguments', 'compiling patterns to integrate their knowledge', 'becoming aware of the limitations of theoretical knowledge in the transfer of theory to practice". Course descriptions tend to focus primarily on subject content that students will be learning. Because learning is not simply a product, but a series of activities the process itself is interesting as well. Developing skills and capabilities is as important as formal knowledge. In other words, *how* students approach their subject is as important as what they end up knowing [4]. However, the problem is the limited information regarding the way students approach their learning and to what extent the learning process matches the intended learning outcomes of teaching staff in dealing with information. A potential solution is applying *learning analytics* in providing information regarding the learning experience. Learning analytics is generally defined as the measurement, collection, analysis of reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs [5].

1.1 Learning analytics as Part of Problem Based Learning at Maastricht University

At Maastricht University (UM), the main purpose of education is to facilitate the integrated and professional development of the individual student. Learning revolves not around courses, but around students' academic and personal development [6]. The strategic agenda of Maastricht University notes (p. 13): "In the next years, attention will be paid to UM's internal quality assurance systems. Impact of innovations is going to be measured by making use of *learning analytics*. Detailed information will be collected on learning processes (such as learning styles and grades), in order to identify new ways of learning that are fit for new generations of students" [6]. In other words, gaining insights into the learning process of students is perceived as important by the UM. An important question is if and *how* it is possible to receive such insights in the process of students' learning by analysing quantitative and/or qualitative study data.

The learning process of students is interlinked with the aim of the UM to train students in self-regulated learning (SRL) skills [6]. Generally, SRL consists of three main components: metacognition, motivation, and behaviour / cognition [7]. The last component refers to learning strategies that assist the learner in the effective processing,

use, and manipulation of information [8]. Nowadays, an important aspect of learning is dependent on effective information processing and the ability to cope with an increased volume of information [9].
Importantly, the deliberate use of information is imperative in the learning process of students; students always engage with some type of information to enhance the learning experience. In this respect, the strategic roadmap of the University Library (UL) indicates that the UL aims to equip the entire UM community with skills required to foster successful students and is committed to developing and providing 21st century skills for a diverse community [10]. "We contribute to the development of flexible learning pathways and identify and recognise diversity and the various ways in which students, lecturers and researchers want to learn – all of this in close cooperation with the faculties and the MUMC. For 2021, the UL envisages an emphasis on self-directed learning and constructive alignment in faculty education programmes and integration of digital skills in information literacy training" [10]. In other words, the UL commits to the challenge of providing students with important 21st century skills and supporting students who want to develop self-directed flexible learning pathways in close cooperation with the UM community and to constructively align these skills within faculty education programmes.

1.2 Information Literacy

Both the UM and the UL put emphasis on analysing learning and important 21st-century skill development. In order to push these developments forward in higher education, learning and teaching should be at the forefront of innovation in learning through the *informed* use of a wide range of evidence contextualised to the specific circumstances of the institution and discipline [11]. In 1998, the American Association of School Librarian and the Association for Education Communications and Technology indicated six standards that librarians and teachers could use to describe information literature students. These standards illustrate the relationship between information literacy and self-directed learning.

The student who is information literate:

1. Accesses information efficiently and effectively
2. Evaluates information critically and competently
3. Uses information accurately and creatively

The student who is an independent learner:

4. Is information literate and pursues information related to personal interests
5. Is information literate and appreciates literature and other creative expressions of information
6. Is information literate and strives for excellence in information seeking and knowledge in general

Information literacy multiplies the opportunities for students' self-directed learning, as they become engaged in using a wide variety of information sources to expand their knowledge, ask informed questions, and sharpen their critical thinking [12].

In 2015, the Association of College and Research Libraries (ACRL) board revised the Information Literacy Competency Standard for Higher Education as a response to the changing information environment [13]. The ACRL framework highlights the importance of the shared responsibilities of faculty teachers and librarians in creating a cohesive curriculum for information literacy. In this way, the framework also reflects the necessity to align information literacy training constructively with faculty curricula. Faculty teachers have a great responsibility in designing curricula and assignments, which foster enhanced engagement with information and scholarship within disciplines; librarians have a great responsibility in identifying core ideas within their own knowledge domain that can extend learning for students. The framework expanded the definition of information literacy to emphasis the dynamic, flexible, individual growth, and community learning as characteristics of the link between information and learning. Information literacy is defined as: "*the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning"*

Furthermore, the framework approaches information literacy from an affective, attitudinal, and valuing dimension of learning as reflected by six frames: (1) Authority Is Constructed and Contextual (2) Information Creation as a Process (3) Information has Value (4) Research as Inquiry (5) Scholarship as Conversation, and (6) Searching as Strategic Exploration. Moreover, it adds thresholds concepts and meta-literacy in defining information literacy (Association of College Research Libraries, 2015). These dimensions and concepts are elaborately described in a recent review about the changing role of information literacy skills in higher education [14].

1.3 Informed Learning

Informed learning is a distinct way to approach information literacy. It addresses its situated and critical nature compared to the traditional approach of teaching information literacy as a discrete skill [15]. Information literacy can be categorized in a functional, situated, or critical approach [16]. The functional approach to information literacy assumes that students will be able to apply information skills acquired in higher education within the various settings in which they learn. The situated approach emphasizes the role of information in specific contexts (e.g. disciplinary or professional setting), while the critical approach aims to make students aware of social and political aspects of information productions and use. The functional approach is most often utilized in information literacy efforts in higher education, but does not account for the situated and critical perspective of information literacy [17].

The central idea of informed learning – in a functional, situated, and critical approach - is that students should learn to use information in the context of learning about a topic. By adopting an informed learning approach, information literacy will be merely positioned within the disciplinary classroom. Advancing informed learning in higher education requires that academic librarians, with their knowledge of how students use information to learn, collaborate with teachers to integrate information literacy into course curricula. Informed learning has three main principles: 1) informed learning builds on learners' current informed learning experiences 2) informed learning promotes simultaneously learning about disciplinary content and the information using

process 3) informed learning enables learners to experience using information and subject content in new ways [15]. Several characteristics of informed learning are 1) engaging with information (i.e. awareness of different ways of using information), 2) subject-content information (i.e. focus on knowledge creation and diverse forms of information, such as textual, visual, and auditory), and 3) pedagogy (i.e. active learning techniques, such as collaboration and independent learning, problem-solving, evidence-based practices, and independent research [15]. Like other contemporary approaches for designing learning environments, informed learning tends to employ active learning techniques, such as independent learning, problem-solving, and evidence-based practice [18]. The pedagogy of informed learning fits well within the problem-based learning philosophy of UM, in which students actively and collaboratively try to solve problems related to the course content [19].

1.4 Learning Styles and Strategies in Dealing with Information

An important aspect of instruction is to understand the difference between learning styles of teachers and students, as most teachers adopt a style of teaching related to their own learning style. However, student might apply different learning styles in dealing with information. To be aware of one's own learning style can support in the learning process and can avoid misunderstanding between instructor and student. *Learning styles* are defined as a combination of cognitive, affective, and psychosocial behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment [20]. Learning styles define learning strategies to a certain extent. The effective use of different learning strategies is an important part of self-regulated learning [8]. Nowadays, an important aspect of learning is dependent on effective information processing and the ability to cope with an increased volume of information [9]. However, we have limited insights whether students use and switch between various learning strategies in effectively dealing with information.

1.5 Problem Statement

Ideally, curriculum and course designers take the deliberate use of information into account when developing courses and expanding the learning experience of students. Even if they do, we have limited insights in the learning behaviour of individual students. In addition, we have little insights whether intended learning outcomes of teachers and instructional designers match the expected learning outcomes of students. Furthermore, students may have limited awareness of their learning behaviour. A solution could be to collect data to enhance the learning experience of learners. However, less is known about *what* kind of data could or should be collected and analysed continuously to measure and enhance a successful learning experience related to information use. However, there is a need to analyse and evaluate informed learning behaviour of students and to analyse whether discrepancies occur between the intended learning outcomes of course designers and the actual learning outcomes of students related to the link between the use of information and self-directed learning.

Aim of this paper The aim of the present paper is to answer the question how we can

experience and study success of students. More specifically, in what way can we continuously collect data in a structured way about the link between information and the learning process to receive insights for both teachers and students? How do teachers and students perceive informed learning and how can we provide recommendations and feedback to teachers and students regarding the intended learning outcomes and students' learning? More specifically, the first part of this review focuses on how to analyse informed learning and the second part about how to analyse learning styles and strategies.

2 Analysing Informed Learning at Faculty Program Level

The ACRL board defined a framework which could be useful as an inventory to approach faculties regarding informed learning [13]. The framework uses six frames, each consisting of a concept central to information literacy. These six concepts are: 1) Authority Is Constructed and Contextual 2) Information Creation as a Process 3) Information has Value 4) Research as Inquiry 5) Scholarship as Conversation 6) Searching as Strategic Exploration. It is suggested by the ACRL to use this framework as a collaboration among librarians, faculty, and other institutional partners to redesign instruction sessions, assignments, courses and curricula. The framework defines several questions, which can be helpful to start the conversation with faculties regarding informed learning:

- "What are the specialized information skills in your discipline that students should develop, such as using primary sources or accessing and managing large data sets?"
- "What information and research assignments can students do outside of class to arrive prepared to apply concepts and conduct collaborative projects?"
- "What kind of workshops and other services should be available for students involved in multimedia design and production?"
- "In your program, how do students interact with, evaluate, produce, and share information in various formats and modes?"
- "How might you and a librarian design learning experiences and assignments that will encourage students to assess their own attitudes, strength/weaknesses, and knowledge gaps related to information?"

3 Analysing Informed Learning at Skill Course Level

Assessment of information literacy instruction is essential to demonstrate the efficacy of the services to university stakeholders [21]. The ACRL framework [13] places greater emphasis on student engagement with information (e.g. questioning, collaboration, and conversation), while most of the current information literacy assessment supports the former ACRL standards [12]. The framework suggests shifting the assessment of specific discrete skills towards a focus on the learning process and engagement with information concepts. In other words, current practices focus on specific learning outcomes identify in the ACRL standards, while the ACRL framework puts larger emphasis on a general critical disposition towards information in the disciplinary context. This

in turn will require addition assessment strategies to support deeper engagement with the learning process of students.

Anderson [21] discussed the new ACRL framework as a new way of looking at information literacy in terms of assessment. Both summative assessment (i.e. assessment in providing important information *as* learning of a completed session or course) and formative assessment (i.e. assessment meant to contribute to the learning process) are needed to measure the use of information in the learning process. Assessment tools, such as guided group discussions, online discussion boards, and web 2.0 technologies could be used as formative assessment. In guided group discussions, both notes and observation of instructors and discussion audits and logs can collected, coded, and analysed qualitatively to provide data for assessment of library services. Moreover, online discussion boards are commonly used for formative assessment of student learning. Lastly, web 2.0 tools (e.g. Facebook, blogs, and Twitter) could be used for assessing instructions regarding information literacy.

A recent systematic review described and compared outcome assessment of information literacy in undergraduates [22]. See Table 1 for an overview of multiple assessment methods. Erlinger [22] employed two frameworks for the assessment types: formative (assessment during instruction) versus summative (i.e. assessment after learning is complete) and Kirkpatricks's four levels of assessment [1]. These four levels are: 1) Reaction: Did students like it?, 2) Learning – Did students get it?, 3) Behavioural – Can students do it?, and 4) Results – does it matter?

Table 1: Strength and weaknesses of assessment types

Type of assessment (SUM or FOR, 1-4*)	**Strengths**	**Weaknesses**
Surveys (SUM, 1)	Ease of administration; ease of scoring and comparison; good measure of perceived self-efficacy; low cost; quick to administer; useful feedback to instructors.	They do not measure learning; students often overestimate their own skills; they focus on intentions not behaviour; students may tell us what we want to hear; they often provide little depth or detail in responses.
Focus groups (SUM, 1)	Ability to ask follow-up or clarification questions; ability to collect data from several participants at once; the generation of rich descriptive data; can provide unexpected results not accounted for in other forms of assessment	Require a great deal of time to administer; difficult to synthesize and code results; require training for good facilitation; learners may be uncomfortable expressing true opinions and tell us what to hear
Objective tests – locally developed (SUM or FOR, 2)	Ease of administration; ease of grading; low cost; efficient assessment of a large number of students; generation of easily reportable numeric data; familiar-	Lack of authenticity; do not measure higher-order skills; can be time-consuming to create; measure recognition rather than recall; oversimplify concepts; usefulness can be threatened by teaching

	ity and comfort on the part of administrators and stakeholders; high reliability.	to the test; issues of vocabulary and culture can interfere
CATs and Performance Measures (FOR, 2)	Immediate feedback; contributions to learning; ability to capture higher-order skills; valid data; giving students a realistic picture of skill set while there is still time to adapt; quickness of administration; acting as "assessment for learning"; low cost	Difficult to measure, code, and quantify; information gathered is very broad; have limited generalizability to other settings; can be time-consuming to create
Authentic Assessment (SUM and FOR, 3)	Contextualization of assessment; high validity; measurement of higher-order skills; demonstration of behaviour change; easily aligned with existing instructional goals; account for different learning styles; provide direct evidence of learning; students know the expectations in advance; foster motivation and engagement	Very time-consuming for students to produce and for instructors to score; require high degree of faculty collaboration; difficult to determine how students approached the problem and if they received outside help; require the development of clear grading criteria or scoring can be subjective and unreliable
Rubrics (Flexible tool)	Consistency in scoring; efficiency in scoring; the development of a set of agreed-upon learning values; encouragement of meta-cognition and self-reflection; direct and meaningful feedback.	Challenging and time-consuming to create and norm; training required for use; reflect the product, not the process
Standardized Instruments (SUM, 2)	Do not require local development; use a variety of formats and scenarios; are often more authentic than locally developed tests; are considered valid; useful for establishing a campus-wide baseline; useful for starting conversations with stakeholders	High cost of purchase, intimidating to both faculty and students; difficult to recruit students; difficult to interpret data without statistician assistance; difficult to adapt for students with disabilities; lag behind development of research tools and related software; not well suited to assessing at classroom level

CAT = Classroom Assessment Techniques, * SUM = Summative assessment, FOR = Formative assessment; number 1 to 4 refer to the levels of Kirkpatrick, with level 1 = reaction, level 2 = learning, level 3 = behavioural, level 4 = results. *Adapted from [22]*.

Mixed Method Approach A recent study designed an assessment, which could determine the impact of a course-integrated model of library instructions on students' learning and achievement [23]. The project and curriculum was called *Teaching Research and Information Literacy* (TRAIL). Writing faculty introduced the students to content

about the research process and information literacy via activities, readings, tutorials, and reflections before students had classroom instructions by a librarian. They used a mixed-method approach to assessment, using both qualitative and quantitative data representing indirect and direct evidence of student outcomes. Data collected included student reflections (TRAIL only), faculty debriefs (TRAIL faculty), final papers (TRAIL and non-TRAIL), final course grades (TRAIL and non-TRAIL) and grand point average (GPA) at the end of the first semester (TRAIL and non-TRAIL). Quantitative data were collected by rubrics, created by librarians). The rubrics quantified students from score 1 (*Marginal)* to *Emerging (*score 2), to *Developing* (score 3), and to *Advanced* (score 4). The quantitative design evolved in collaboration with a Principal Research Analyst, leading to additional knowledge for librarians about research designs.

Overall, the evaluation of student reflections, final papers, and faculty observations showed a positive relationship between the TRAIL curriculum and student learning. More specifically, student reflections indicated that over 50% scored *Advanced* or *Developing* for all six criteria. These criteria were: 1) academic research changes, 2) source selection, 3) challenges, 4) attitude, 5) transferability, and 6) think like a researcher. In addition, faculty members of the writing program (MWPs) observed student learning outcomes. Four out of five MWPs thought that TRAIL students were thinking and writing more like researchers compared to students in previous introductory composition courses. However, two of them did not observe TRAIL students to better incorporate evidence from several viewpoint compared to students they had taught in the past. This evidence implies that students competencies related to incorporation of evidence from several angles required more instructional time and attention. Lastly, it should be noted that even tough findings point to the benefit of the TRAIL curriculum on student learning, it did not show evidence of a positive correlation with student's GPA [23].

Course Syllabi Analysis Another way to analyse *informed learning* is to review course syllabi. Reference librarians (i.e. librarians who recommend, interpret, evaluate and/or use information resources to support users with specific information needs) employ syllabus reviews to create workshops and other library instruction activities that align with the information literacy learning outcomes articulated by instructors and departments. A recent review of four conducted syllabus reviews evaluated the content of a large sample of syllabi (n= 1153) and generated a rich data set about the nature of teaching and learning [24]. The most recent of these four syllabus reviews developed inventories of courses that address information literacy learning outcomes and 21st century skills while revisiting questions about syllabus quality and the culture of teaching and learning addressed in previous reviews. This review also identified courses with Student Learning Outcomes (SLOSs) and assignments that aligned with information literacy standards (articulated by the Association of College and Research Libraries [12]). Outcomes of the review was that SLOs aligned with information literacy standards appeared on 58.5% of the syllabi (674 syllabi described one or more course SLOs that aligned with one or more ACRL information literacy standards). In addition, 683 (59.2%) of the syllabi identified an assignment that aligned with an information literacy SLO (regardless of whether the instructor described an information literacy SLO on the syllabus). The paper provides rubrics, which are useful to assess informed learning.

4 Self-Regulated Learning and Information

Self-regulated learning (SRL) skills development is an important part of studying at UM. Generally, SRL consists of three main components: metacognition, motivation, and behaviour / cognition [7]. The last component refers to learning strategies that assist the learner in the effective processing, use, and manipulation of information [8]. Teachers can instruct the use of learning strategies by implicit and explicit instructions [25, 26]. An implicit instruction means that teachers prompt student to use strategic behaviour without addressing it or when teachers act as role model without informing the learning about the significance of this behaviour. Explicit instructions mean that teachers also explicitly explain and/or demonstrate *why, how,* and *when* it is important to use a strategy and how it can improve students' performance. Teachers rarely integrate SRL in their classroom because of difficulties with implementing theory into practice [26, 27].

Analysing information use in learning styles A definition of *learning styles* is a combination of cognitive, effective, and psychosocial behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment [20]. No consensus about an accepted method to assess individual learning styles currently exists, but several potential scales and classification are in use [28]. In their review of 2009, the authors outline four learning style measurements [28]. These tools could be used to analyse learning styles that students use.

The first measurement tool is the Learning Style Inventory Instrument (LSI). LSI is derived from an experiential theory and model of learning [29]. In this experiential model, learning is viewed as a continually recurring problem solving process in the four-stage cycle: 1) concrete experiences are followed by 2) reflective observations. These observations can lead to the formulation of 3) abstract concepts and generalizations, that in turn, lead to 4) active experimentation to test particular hypotheses. Learners are described as divergers, convergers, assimilators, or accommodators based on learner's preferences in terms of concrete vs abstract, and action vs reflection [30].

The second instrument is the Learning Style Questionnaire (LSQ), The LSQ provides 80 statements, which have to be answered with agree or *disagree*. The answers will lead to a distinction into one of four distinct types of learners: 1) activists (i.e. learn primarily by experience), 2) reflectors (i.e. learn from reflective observation), 3) theorists (i.e. learn from exploring associations and interrelationships), and pragmatics (i.e. learn from doing things with practical outcomes) [31].

The third assessment of learning styles is the Canfield Learning Style Inventory (CLSI). The CLSI provides 30 multiple-choice questions with four answer possibilities. Learning is described in four dimensions: 1) conditions for learning, 2) area of interest, 3) mode of learning, and 4) conditions for performance [32].

Analysing information use in learning strategies Learning styles define learning strategies to a certain extent. A recent extensive review critically reviewed ten different learning strategies [34]. These ten techniques were evaluated on their utility by assessing their benefits to generalize across four categories of variables. These variables are learning conditions (e.g. learning environment, studying alone or within a group),

student characteristics (e.g. age, ability, level of prior knowledge), materials (e.g. simple concepts to complicated science texts), and criterion tasks (e.g. different outcome measures, such as memorization, problem solving, and comprehension). For this review, we focus on the learning techniques in relation to materials, as these are the main indicator of the use of information sources (see Table 2).

Table 2. Learning Techniques (adapted from [34])

Technique	Description
Elaborative interrogation	Generating an explanation for why an explicitly state fact or concept is true
Self-explanation	Explaining how new information is related to known information, or explaining steps taken during problem solving
Summarization	Writing summaries of to-be-learned texts
Highlighting/underlining	Marking potentially important portions of to-be learned materials while reading information
Keyword mnemonic	Using keywords and mental imagery to associate verbal materials
Imagery for text	Attempting to form mental images of text materials while reading or listening
Rereading	Restudying text material again after an initial reading
Practice testing	Self-testing or taking practice tests over to-be-learned material
Distributed practice	Implementing a schedule of practice that spreads out study activities over time
Interleaved practice	Implementing a schedule of practice that mixes different kinds of problems, or a schedule of study that mixes different kinds of materials, within a single study session

The authors qualified practice testing, distributed practice, rereading, elaborative interrogation, and self-explanation as positive indicators of dealing with materials. Summarization was qualitied as potentially positive with insufficient evidence, and highlighting, the keyword mnemonic, image use for text learning were indicated as ‘qualified’, meaning that the technique yielded some positive effects under some conditions / groups, but not others. When taking all criteria (i.e. learning conditions, both practice testing and distributed practices were rated as high utility learning techniques, because learners with different characteristics have been shown to enhance performance across many criterion tasks and educational context. Elaborative interrogation, self-explanation, and interleaved practice were ranked to moderate utility. Their benefits do generalize across some variable, but the evidence for their efficacy was limited. The other five techniques (i.e. summarization, highlighting/underlining, keyword mnemonic, imagery use for text learning, and rereading) were rated – in general - as low utility.

5 Discussion

The aim of the present paper was to describe how we can analyse informed learning at Maastricht University. A review of the literature indicated the complexity of analysing learning behaviour. Many disciplines, such as learning analytics, learning sciences, learning design, educational design, and educational psychology are investigating the beneficial use of analysing learning. Common ground is that it is important for institutions, teachers, and students to get insights into learning behaviour. Informed learning can be analysed at different levels (e.g. institutional, programme, and course level) and from different perspectives (e.g. institutional, teacher, and student).

By using the *informed learning* theory, information literacy education is approached differently. While information literacy is often addressed in a functional way (i.e. teaching information literacy as a discrete skill), the situated and critical approach are less taken into account [15, 17]. The quality of teaching information literacy and the importance of the information literacy skills will increase by teaching this skill in constructive alignment with specific disciplinary contexts (i.e. situated approach), increasing awareness about social and political aspects of information and using information in a new way (i.e. critical approach). These aspects should be part of and linked to the individual learning process of students [17]. Constructive alignment is a holistic curriculum design approach requiring optimal coherence between the three elements intended learning outcomes (ILOs), assessment methods, and teaching and learning activities (TLAs) [35].

In order to have an overview of informed learning practices, a mixed approach (i.e. both quantitative and qualitative data) should at best be followed as the combination of these data provide valuable information regarding the analysis of informed learning. For example, a recent study used rubrics and GPAs as quantitative data, and questionnaires for faculty members as qualitative data representing both direct and indirect evidence of student learning outcomes [23].

Moreover, qualitative data can be obtained from program directors and faculty teachers. At the faculty level, the ACRL framework [13] provides highly useful questions to be asked in focus groups to collect qualitative data regarding information literacy training as part of the learning process. In addition, a survey could reach a larger group of faculty teachers in providing additional qualitative data. Moreover, a course syllabi analysis would provide highly useful information to collect data regarding the intended learning outcomes of teachers with respect to information skills. A recent paper described several reviews which performed several course syllabi analyses to assess the intended learning outcomes [24]. Approximately 60% of learning outcomes aligned with information literacy standards. In addition, almost 60% of the course manuals provided an assignment that aligned with the learning outcomes. Thus, an analysis of course manuals would provide a rich-data set regarding the status-quo regarding intended learning outcomes and assessment at the UM.

At a skills course level, it is highly important to follow a mixed-approach in collecting both qualitative and quantitative data. Data should be collected based on both summative and formative assessment [21]. Summative assessment is taken into account with surveys, focus groups, objective tests, authentic assessment, and standardized assessment; formative assessment with objective tests, CAT / performance measures, and authentic assessment [22].

All these measurements have several advantages and disadvantages (see Table 1). These should be taken into account to analyse data regarding information practices. Overall, an advantage is that most assessment take a different level of assessment into account: surveys and focus groups assess reactions (level 1); objective tests, CAT/performance measures, standardized instruments assess learning (level 2); authentic measurements assess behaviour (level 3). However, none of these tests assess results (level 4) [1]. The latter level considers the big picture and long-term effects of instructions. These attempts to determine whether the instruction had any lasting effect on the life of students. If the UM wants to pursue a longitudinal approach (i.e. beyond graduation) regarding information literacy education, level 4 assessment should be taken into account.

An important aspect of teacher instructions is to be aware of differences between learning styles and students. Most teachers might adopt a teaching style related to their own preferred learning style. Students might apply different learning styles in dealing with information. Several instruments are available: the Learning Style Inventory Instrument [30], the Learning Style Questionnaire [31], the Canfield Learning Style Inventory [32], and the Index of Learning Survey [33]. These instruments could be used for both teachers and student to collect data regarding preferred learning styles in dealing with information.

Information processing is an important part of self-regulated learning (SRL), as it is related to the behavioural/cognitive element of SRL [8]. Generally, teachers rarely integrate explicit instructions regarding SRL in their classroom because of difficulties with implementing theory into practice [26, 27]. It is of utmost important that teachers do learn how to explicitly instruct all components of SRL [8], including the use of information in self-regulated learning behaviour.

For students it would be highly beneficial to be aware how they deal with academic study materials and how to intervene if necessary. These learning techniques are most effective in dealing with materials: practice testing, distributed practice, rereading, elaborative interrogation, and self-explanation [34]. Data could be collected – with surveys or focus groups – regarding the use of these learning techniques in dealing with information. However, it should be noted that in general practice testing and distributed practice were qualified when all criteria (i.e. learning conditions, student characteristics, materials, and criterion tasks) into account, both practice testing and distributed practices were rated as the highest utility learning techniques [34]. In addition, it is important to acknowledge that a self-regulated learner should be able to adapt learning strategies with regard to specific learning outcomes in specific courses.

We have to be careful in the practical implications and conclusions of analysing learning and in particular learning styles. Potentially analysing learning styles and strategies should be aimed to increase awareness about the use of an individual's learning styles and strategies. When these styles or strategies are maladaptive for a specific course, interventions could be made to change the learning behaviour. However, there is no such thing as a 'best' learning style. A recent invited comment indicated many problems with the notion of learning styles [36]. First, people cannot simply be clustered into specific and distinct groups. Most differences between people on a particular dimension or continuous and not nominal. Secondly, the psychometric qualities (e.g. validity and reliability) of learning style instruments are rather low [37]. An often-used measure is self-report, and often learners are unwilling or unable to accurately report

their learning styles. In addition, self-reported preferred way of learning is low predictive validity for the way people learn most effectively. In other words, self-reports of learning do have a low correlation with objective measures of learning. In addition, the self-reported preferred way of learning is often a bad predictor of the way people learn most effectively.

By analysing information in relation to learning, academic librarians can also determine their gaps in knowledge and abilities needed to collaborate with others to integrate information literacy into courses using an informed learning approach. In order to collaborate between academic librarians and faculty teachers, focus should be on gaining knowledge and abilities to advance informed learning [17]. Focus should be put on I) developing a thorough understanding of informed learning. II) Being aware of current trends of information literacy. III) Understanding teaching and learning theories and models and these may align with informed learning, instructional design models, and assessment practices for analysing learning of students related to using information as well as course content and IV) developing excellent communication skills to collaborate with faculty teachers to cultivate shared goals on the advancement of content-focused learning through engagement with information.

In summary, it is highly advised to collect both quantitative and qualitative data regarding informed learning based on the evidence reviewed in the present paper. The five most important recommendations for the UM regarding analysing informed learning are: 1) Analyse to what extent the functional, situated, and critical approach of informed learning are practiced with a mixed approach. 2) Quantitatively analyse the issues related to information use within the learning process in a student population by using surveys and the perception of teachers (faculty and library) about the use of information in the learning process by using surveys 3) Qualitative analyse how students and teachers deal with information in the learning process by using focus group 4). Quantitatively analyse to what extend intended learning outcomes in course manuals meet information literacy standards. 5) Use both formative and summative assessment to measure information literacy skills and include the four levels of assessment, including level 4 (results). This level of measurement considers the big picture and long-term effects of instructions and should be taken into account if the UM wants to pursue a longitudinal approach regarding informed learning.

Data can be collected from several perspectives (institutional, teachers, and student). At the UM, it is vital to collect data regarding the students' perspective, as education at the UM focus on academic and personal development. In addition, students should develop a sense of responsibility and ownership of their education. By collecting these data, we can increase the awareness regarding information literacy as part of the learning process. In addition, these data can provide input for useful interventions to optimise information literacy education at the UM in order to provide students with one of the most essential skills for their future career.

During the conference on Learning Information Literacy across the Globe the first preliminary results of the overall project (Information-Wise project) will be presented.

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Information Literacy, epistemic cultures and the question „Who needs what?“

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Abstract
This conference paper introduces "Information Didactics", defining it as a new didactics concept centering on the analysis of epistemic-culture-specific behaviour as a basis for the development of instructional activities. It broadens existing traditional conceptions of Information Literacy (IL) to create a universally adoptable didactical concept applicable not only to classical IL training but also to other instructional activities in the field of Information Science, for example the development of data literacy skills.

Keywords: Information Didactics, Information Literacy

1 What is Information Didactics?

Information didactics deals with learning processes related to the handling of information.[1] One of the fundamental hypotheses posited by information didactics is the dependence of the specific types of information, and the respective handling of that information, on the epistemic culture context of the learners.[2]

With regard to theoretical modelling, the objective of information didactics is to:
- identify specific types of information in different social contexts (epistemic culture-oriented information typology),
- describe and analyze specific types of practical information handling in these contexts (epistemic culture-based information practice),
- take account of the pre-requisites involved in information handling in these contexts (epistemic culture-specific requirement profiles), and in addition
- take into consideration the dominant learning practices in these contexts (epistemic culture-specific didactic practice).

The application-related goal of information didactics consists in the (further) development of didactic concepts capable of supporting learning processes relating to the competent handling of information in line with the type of epistemic culture background applicable to each particular case. Information didactics is particularly relevant in interdisciplinary teaching and the transdisciplinary transfer of knowledge, as here the

character of the teachers' epistemic culture will differ from that of the learners. This is the general rule within the context of practice-centered information brokerage activities.

The term "information didactics" was coined by the linguist Matthias Ballod in his 2007 habilitation thesis. Here Ballod presents arguments in favour of a general didactics of information transfer against the background of the digital transformation, i.e a didactics delivering concepts and methods for teaching those skills and abilities enabling the competent handling of information. Applied to information science, his concept of information didactics can be described as a didactics of information literacy in the sense of a didactics related to the handling of data, information, information infrastructures, tools for the production and provision of information, strategies of information seeking, and the related ethical, legal, economic and social issues. Within the taxonomy of didactics in general, it is to be understood as a concept covering the whole area and including content of interdisciplinary relevance, analogous to media didactics. However, while Ballod bases his concept on a semiotic perception of information and concentrates on its further theoretical development as the foundation of a transfer science with the goal of describing, designing, controlling and optimizing knowledge transfer processes, the unsystematic empirical application examples he uses to illustrate the concept of information didactics in his habilitation treatise focus primarily on teaching the use of digital information resources such as subject databases or search engines. The practical application of information didactics is thereby not only eclipsed by the theoretical agenda but also by reflectance from the information science oriented discussion on information literacy teaching.

In 2016, one of the authors of this article was appointed to the Chair of Information Science and Knowledge Transfer at the Faculty of Information Science of the FH Potsdam, the first known international use of the designation. Although the definition developed within the remit of this professorship, and here presented by the authors of this article, does indeed make reference to Ballod's concept, it also simultaneously incorporates an information science and sociological perspective into the definition by favouring a fundamental enquiry into the epistemological origins of information didactics over a topical agenda. The next section will take a closer look at this perception of information didactics. The corresponding remarks are to be understood as representing possible approaches to further discussion. They have been developed on the basis of both participatory observation and initial exploratory studies conducted within the interdisciplinary framework of the Professorship for Information Didactics and Knowledge Transfer, and have been further refined by both authors within the subject focus of the Information Literacy Section of the KIBA and with reference to practical library-related perspectives.

2 Epistemic cultures, information and information didactics

Karin Knorr-Cetina defines epistemic cultures as "practices, mechanisms, and principles that (…) determine how we know what we know within a particular field of knowledge".[3] So the question is: How is knowledge in a specific epistemic culture generated, validated and communicated?[4] From an information science perspective this approach is productive, because it provides the analytical basis for the investigation of specific processes of knowledge construction both in terms of the nature of the information generated during these processes and in terms of the information practice specific to that particular epistemic culture, in other words the testing, evaluating, processing, communicating, and sharing of information.

This approach, based on a descriptive phenomenological notion of information which looks at information from the perspective of empirical information behaviour rather than from that of the historical semantics of the concept of information, is the one followed, for example, by Capurro & Hjørland (2003) in their examination of the historical development and discipline-dependent differentiation of information.[5] The question regarding the particular concept of information underlying each different epistemic culture seems less relevant in the context of information didactics than the question as to what comprises information in each epistemic culture, and how information is used and processed in the various stages of epistemic culture construction. In addition information is regarded as a fluid and context-dependent concept as it undergoes the metamorphosis transforming it from data into knowledge,[6] whereby, according to North, data, information and knowledge are distinct categories characterized by the degree to which they are charged with meaning and context. However, the matter of what, in what context and for whom, is defined as data, as information or as knowledge is a question of cognitive interest and context. If, for example, a research project is concerned with the particular extent to which certain raw climate data have changed significantly over a certain period of time within a given region, then – set against the background of this cognitive interest and the context of this project – monthly aggregated data measuring the precipitation in a certain region are the result of the project and thus form a knowledge store. This store contains the raw climate data (=data), the interpretive selection of the precipitation measurement data obtained in accordance with the research topic (=information) and their corresponding context-based interpretation (monthly aggregation). In a second research project focusing on the question of whether monthly aggregated precipitation measurements are meaningful parameters for the description of climate change within a given region, the monthly aggregated precipitation measurement data form the starting point, and hence one of the databases instrumental in answering the question. These data are then transformed into information on the basis of, for example, their relation to other measurement parameters used to calculate climate change. The interpretive synthesis of the data evaluation with reference to the initial research question will then represent the knowledge developed within this project.

In addition to the analysis of information practices, and resulting from the fluid and context-dependent concept of data, information and knowledge described above, information didactics also includes the analysis of data and knowledge practices, thereby aiming to develop conceptual methods of promoting competence in dealing with phenomena from all three categories of the knowledge construction process.

The results of the epistemic culture-based analysis of information typology and information practice form the basis for the development of epistemic culture-specific prerequisite profiles for the design of information didactics-related models of information literacy instruction. We suggest using an example to illustrate how this praxeological perspective provides added value to a deep understanding of the epistemic culture prerequisites relating to information literacy:

As a part of the curriculum development project "Design 0815" conducted by the FH Potsdam (funded by the Stifterverband 01 / 2016-03 / 2019, Prof. Constanze Langer, Department of Design; Prof. Dr. Frank Heidmann, Department of Design; Prof. Dr. Antje Michel, Department of Information Science), the curricula of the FHP design study programs were evaluated and revised regarding the integration of learning content aimed at enabling students to participate successfully in the digitized world of life and work. At the same time, this framework offered an opportunity to actively observe the epistemic culture(s) of the design disciplines (by conducting joint courses, for example, or by cooperatively supervising bachelor theses within the common research process), and to contrast the insights thus gained with the conventions of the information science epistemic culture. A sub-project designed to provide insight into the appropriate curricular anchoring of problem-solving competencies in the design curricula led to the realization that discrepancies in problem-solving behaviour between the information sciences and the design disciplines can be characterized by differences in the way knowledge is generated. In the information sciences the dominating practice is epistemological, since it is rooted in the empirical research process, whereas in the design disciplines problem-solving behaviour is characterized by an iterative design-oriented cognition process (see Fig. 1a & 1b).

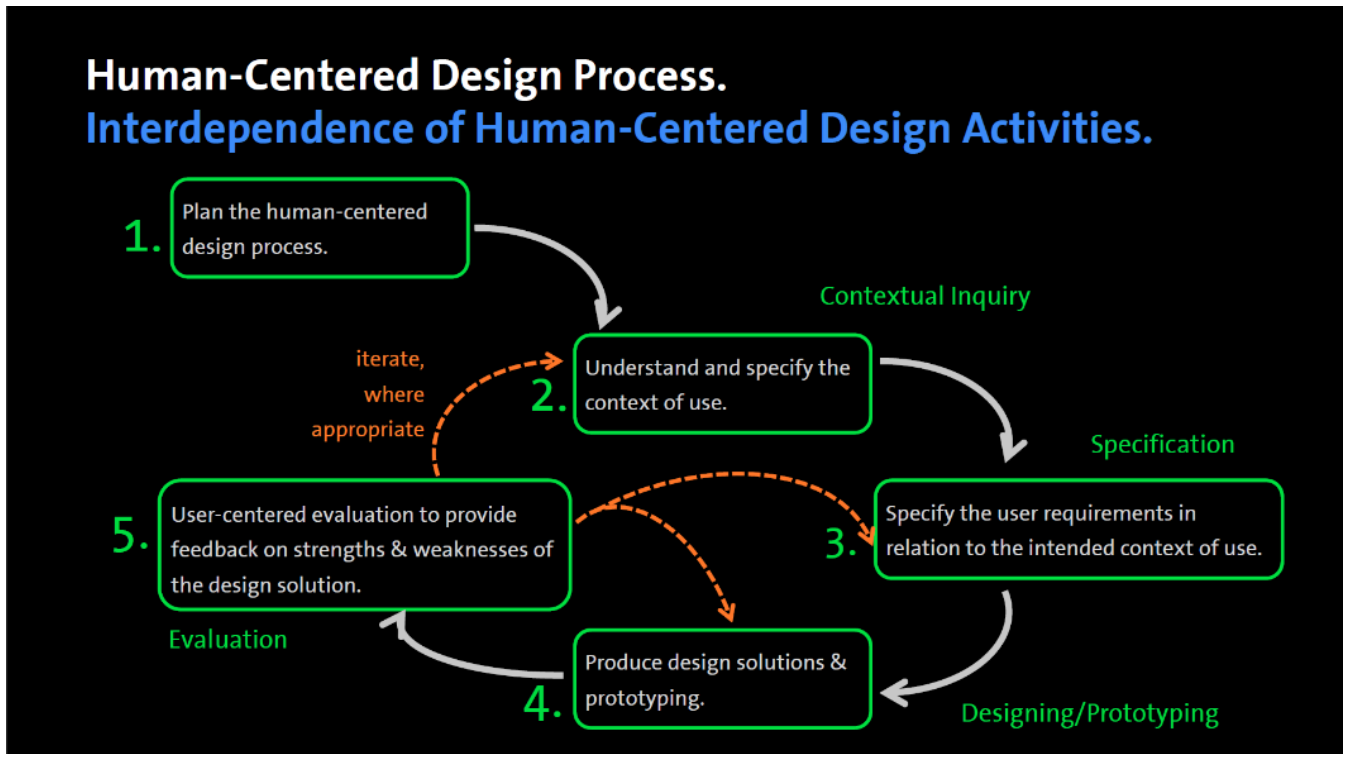

Fig. 1a: Human-centered design process, own graphic by FH Potsdam.

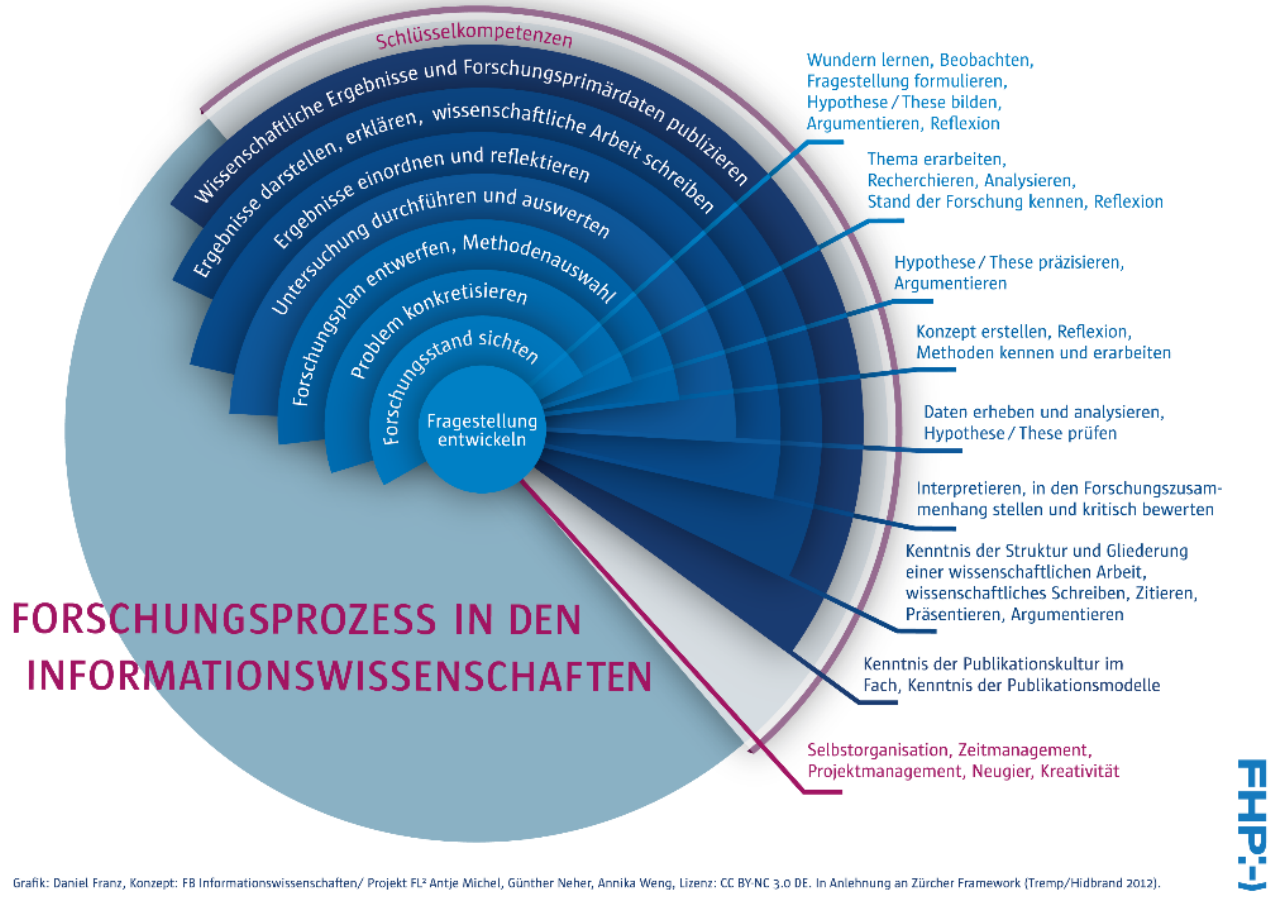

Fig. 1b: Research process in information science, own graphic by FH Potsdam.

Throughout the problem-solving process, agents in both epistemic cultures use different methods of generating, assessing, processing, and producing information, and many of

these methods are employed by both disciplines. However, from an epistemological point of view the two epistemic cultures pursue differing core interests. While in the information sciences the main interest lies in generating maximally generalizable, objectifiable knowledge, in the design disciplines the predominant focus is on the generation and definition of ideas, which are seen as outlines characterized by subjective inspiration.[7] These differing attitudes lead to similar methods being applied in different ways, with the information generated or processed with their help also being weighted differently.

For example, in both variations of knowledge generation, information retrieval is of secondary importance within the process. While in the information sciences the state of research is usually determined on the basis of an evaluation of the specialist subject literature, with value placed on proceeding in as systematic and inter-subjectively comprehensible a manner as possible, as is, for example, the case when conducting a systematic literature review[8] preliminary to the actual survey, information research during the design process is mainly for inspirational purposes. Subject literature is only one information research element among many other sources of information; literature research is erratic and the information often used by the researcher as a source of inspiration. Information analysis and data collection are often not separated in the design disciplines, and data collection procedures often occur in parallel, or in direct succession, at the same early stage of the design process, together with, for example, interviews with relevant stakeholders within the context of the research question, for example with future users of the product or service to be developed, or with experts. In contrast to the information sciences, these processes are generally not conducted according to social scientific principles, nor are they systematically evaluated or documented in any inter-subjectively comprehensible manner. In addition, the knowledge generated in the interviews mainly serves as inspiration, and to effect a role shift towards that of user or expert in order to cultivate a more diverse perspective on the subject.

This application of congruent methods to diverging attitudes requiring varying epistemological categorization including the resulting variations in attitude towards the generated data and information, differences in the assignment of relevance and deviations in the use of the generated data and information suggests that the teaching of information-handling skills cannot succeed using a single standard system.

The example shows that the analysis of information practices within the specific epistemic culture of a specific target group is an important prerequisite for the development of an adequate concept for the design of information literacy teaching and learning materials. While, for example, the teaching of information research techniques in the information sciences is strongly focused on systematic literature research with its ensuing phases of search strategy development commensurate with knowledge generation, careful source selection, search term documentation and systematic evaluation of the results, this kind of approach to the teaching of information research competence is applicable only to a limited extent to students in the design disciplines. For here, as a result of the very different epistemological end goal, namely that of creating ideas and designs, literature research is merely one of several elements involved in the generation

of information and data. For example, methods and tools designed to support image-guided information handling will have more significance in the design disciplines, where visual literacy training plays an important role.[9] Approaches to teaching literature research skills could, for example, be biased in favour of the concept of berry-picking[10] rather than more systematic approaches.[11] Other relevant methods are, for example, image searching or indeed the use of independent surveys to generate inspirational, but not systematic, impressions. It is important that any form of information literacy teaching based on the principles of information didactics be necessarily viewed from the perspective of the appropriate specific epistemic culture-based practice, resulting from the varying fundamental goals envisaged by the act of knowledge generation or the development of ideas and their transformation into drafts. If instead teachers impose standards of information handling drawn from their own professional backgrounds, there is a danger of obscuring the specific basic interest of the specialist culture – the "triggering" of inspiration, in the case of design – by employing practices and standards running counter to this interest (systematics, strictness of method, objectivity).[12]

It should be understood that this is an idealized viewpoint. The concept of epistemic cultures reflects more closely than the discipline of epistemology the fact that boundaries between disciplines are contingent and that there are sometimes greater similarities between two disciplines at the interfaces of common research areas than there are within a single discipline. In this respect it also should be emphasized that the descriptions of the information science and design-specific epistemic cultures presented here are to be understood as representing ideal points of view.[13]

However, the realization that teachers must always be familiar with the practices of their learners' epistemic culture if they are to make the information to be communicated compatible with their learners' knowledge pool is nothing new. Since the advent of cognitivist and interactionist learning theories, such as those of Lew Wygotski or Hans Aebli, this has been regarded in the didactic sciences as an essential prerequisite for the success of teaching and learning processes.[14] For teachers who come from the same epistemic culture as their learners, this knowledge is usually accessible as implied knowledge (tacit knowledge/tacit knowing).[15] In practical information teaching and learning contexts, such as in libraries for example, this is not necessarily the case. Here the teachers (for example librarians) often come from an epistemic culture different from that of their target groups. However, information practitioners can tap into the knowledge-based information practices of their target groups using an information didactics analysis. Since in daily practice it is possible to carry out this kind of analysis only to a very limited extent, we would regard the job of conducting information didactics analyses of the epistemic culture-specific information practices of our target groups as one of the more important tasks currently facing information science.

3 Extending the focus of information didactics

The above applies all the more given that continuing specialization and differentiation within the academic disciplines, coupled above all with the changes in information practices in the sciences triggered by digitization, pose fundamentally new challenges to the content and methods involved in the promotion of information literacy.[16] Even though, conceptually, information literacy has always related to all these aspects of dealing with information in a comprehensive sense,[17] the main emphasis - at least in the German-speaking world - has been mainly on interdisciplinary instruction in library use, introductions to catalogues and databases, and training in search strategies and search techniques.[18] However, in the aftermath of digitization the need is increasing for the inclusion of topics such as digital publishing, open access, research data management, and bibliometrics, thus addressing a range of complex issues related to a variety of data-related, legal, ethical, economic, and social issues.[19] At the moment there is general uncertainty as to how these new skills, promoted within the context of "Digital Scholarship", might relate to the skills previously taught at universities - this uncertainty also being reflected in the various approaches to systematization in which the relationship between an ever-growing and increasingly differentiated number of "literacies" is described from different perspectives in the form of hierarchically structured models.[20]

For information didactics, however, this somewhat theoretical systematics problem is of secondary importance. The field is primarily concerned with conveying the knowledge and skills that information practitioners in the various contexts within and without academia need in order to develop and create epistemic culture-based teaching and learning practices in all questions to do with the handling of information - understood as a "place-holder" for data - information - knowledge according to the DIK-Ladder - to suit their target groups. Information didactics competence therefore has its place within the context of both classical librarianship training and the qualification of data librarians, data stewards and other experts active in the field of digitally based learning and research processes. The curricula of the data and information-related degree courses should therefore not only be examined to check whether requirements which have arisen in the course of digitization regarding the operative handling of digital data, information and infrastructures are being adequately conveyed, but also whether these curricula are suited to providing the persons seeking qualification with the necessary information didactics skills to enable them to develop epistemic culture-based information literacy teaching and learning materials for their target groups. Linked to this are concrete information didactics research perspectives, such as the development and testing of methodological instruments for the analysis of information practice within different epistemic cultures. In conjunction with this, a further research goal could be the extension and epistemic culture-enriched differentiation of the library didactic framework model[21] as a guide for information science practice in libraries and other information institutions. Particular attention should be paid to the range of topics that have been added in the course of digitization, including digital publishing and open

access, research data management, and bibliometric and scientometric questions, with their diverse legal, economic, ethical and social references.

If compiled in the form of a manual, these could help experts working in information literacy to methodologically identify the epistemic culture-based specifics of their target groups and, on this basis, to develop appropriate training courses with target group-centered content and methodology, which would make a much more effective contribution to strengthening information literacy skills than that effected by methods not based on specific aspects of information practices within different epistemic cultures.

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Digital and information literacy as discursive mapping of an information landscape

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Abstract. This paper presents observations drawn from a dataset in which are recorded dialogues between groups of learners as they propose, negotiate and enact digital and information literacy practices. Members of the groups can be observed introducing and validating informational and technological resources to other group members, and working to configure their information landscape ([10] in ways that then allow them to make judgments about found or encountered information in ways that could not have been possible for them prior to the dialogue. Following David Harvey [5], we propose that the groups are creating "discursive maps" of their information landscapes, used to both define and explore the context. Groups can be observed mapping both real and simulated contexts.

Keywords: Information literacy, information landscapes, discursive mapping.

1 Introduction

When developing information and digital literacy it is important to bring to bear a *repertoire* of techniques for information seeking and use [9]. This repertoire can encompass ways of making sense of found or encountered information. To illustrate how learners develop configurations of information, and use these as the basis for practice, this paper draws on records of how students have made judgments about the informational and digital resources they need in order to undertake collective tasks, and observes how they develop *discursive maps* [5] as criteria against which they then make informed judgments about the relevance of found information. The idea that developing information literacy (IL) is akin to learning to map an "information landscape" is raised by Lloyd (e.g. [10, p. 2]) but not developed in any detail. This paper presents three examples of how mapping, as a discursive practice, is manifested in actual learning dialogues. Space precludes a more systematic investigation here, but for that see [18].

2 Mapping and information literacy

2.1 Mapping as a tool

Mapping is a way that we construe and then construct lived space, a way of not only representing the world as it is, but projecting forward, pre-visualizing a different (and, implicitly, more desirable) place [2]. Mapping involves bounding and delimiting a field of interest, then extracting entities — the phenomena to be observed — and the relations between them from the part of the world being mapped, then plotting these on the field, using some kind of mode of representation [2, pp. 229-30]. A map thereby makes propositions about the world, stating not only "X is there", but that X is in a specific relationship with other phenomena, and things can be inferred about X's positioning and connections in the 'real world' from the depiction on the map [3, pp. 13-14]. Thus, mapping is a medium with *discursive power,* a way of encouraging people to see the world in the same configuration as the mapmaker and make judgments accordingly [3].

Mapping has long been applied to information landscapes as well as geographical ones. A classic organisation chart is a map: elements have been extracted from the mapped space (roles) and plotted to show relations between them (chains of command and reporting). Concept or mind mapping allows the plotting of ideas, concepts and relations between them as elements on a map. Various authors have described how the use of concept mapping can help learners make connections between concepts and, thus, engage in a self-reflective exploration of what they know, making underlying mental models explicit and depicting them visually (e.g. [11]).

2.2 Prior studies of mapping and IL

Steinerova [15] engages students with mapping their 'information horizons'. Her "ecological" approach identifies IL as manifest in *sense-making*, at two levels — the relationships between individuals and information systems, and then those between individuals, connected through social networks and social media. The information ecology is shaped by information behavior and judgments of *relevance* [15, p. 4]:

> *Two stages of information seeking were determined… the orientation and the analytic stages. In the orientation stage it can be productive to build an information horizon as part of information literacy development ([13], [14])…. a map of information sources including experts, criteria of source preferences, issues of interest and information pathways…. By depicting an information horizon we develop information strategies as a special approach to solving an information problem…*

Hultgren [8] uses similar techniques (and also quotes [14]) to study the information seeking of Swedish school leavers as they make choices regarding future study and/or career options. Her research subjects are asked to visualise their information horizons at two points in her study. There is thus a longitudinal aspect — the map (visualisation) becomes a record of how these information horizons change over the study. For both Steinerova and Hultgren, these visualisations can be considered maps because they de-

pict a *positionality* that represents a real-world relation, that of *relevance*, and judgments and choices are represented in the depiction. On the maps, information sources [8, p. 101] "are positioned in order of personal relevance, where the most important in a particular issue are placed closest to the participant and those least relevant are placed further away; that is, the horizon encompasses only those information sources that have been selected as relevant to the issue at hand."

Herring [6], Gordon [4] and Hepworth and Walton [7] all use concept mapping as a pedagogical technique. Hepworth and Walton involve HE students in [7, p. 135] "mapping the subject domain, gaining an overview of areas of knowledge that are important in that domain and how they relate to each other". They report [7, p. 147] the positive impact of this technique on peer-to-peer learning and how groups "agree… on the overall domain and understanding this bigger picture". Herring [6] also reports that students give positive feedback about mind mapping as a technique for learning information literacy. Her students use the map as an *aide memoire*, recognising its value for notetaking, categorising information, and reminding them what they needed to include in an essay and what they do not. Mapping is thereby linked to judgments that they make about relevance. "The students did not merely value the *immediate* value of a concept map, for example, to identify keywords, but also the *future* value…. students were engaged in *iterative reflection* in that most students stated that they went back to their questions and/or concept maps before writing their essay" [6, p. 11]. Gordon concludes that students who use concept mapping [4, p. 20]: "were more efficient in the way they used their time to perform more search operations per minute and more thorough in consistently applying a more concise repertoire of search terms…."

Whitworth et al [19] use concept mapping to help with judgments about the relevance of information in a workplace setting. They study how groups create maps together, through a collaborative process. Significance comes with how groups "talk the map into being" [19] – in other words the maps are created not through internal mental processes but open dialogue and the embodied practice of mapping (cf. [10]).

2.3 Discursive mapping

The studies in §2.2 have as their foci the creation of a tangible, visual representation of an information landscape. However, the final point from [19] suggests that it is less the tangible product, the map itself, that is central to the value of mapping (though as [6], for example, notes, the map does become a locus of reference for later judgments); but the dialogic and discursive activity that takes place as the map is developed. Dodge et al [3, p. 231] observe that: "Ethnographically a map is not a map because it looks like a map, rather mapping is defined by how maps are used in practice and how they perform space". Harvey [5, pp. 111-2] notes that:

> *The discursive activity of 'mapping space' is a fundamental prerequisite for the structuring of any kind of knowledge. All talk about 'situatedness', 'location' and 'positionality' is meaningless without a mapping of the space in which those situations, locations and positions occur. And this is true whether the space being mapped is metaphorical or real.*

The map, therefore, does not have to have a visual manifestation to be a way of configuring the landscape and making it the basis for judgments about found information. *Discursive maps* [5] come in many forms, including specifications for information systems; procedural rules that should be followed in order to secure resources within an organisational setting: and so on. An organisational chart can depict chains of command and hierarchies in an organization visually, but the true *operation* of these power relations come in *practices*; and the way that we make judgments about information in a given setting is an outcome of the nexus of practices and relationships in that setting [10]. What *agreements* have been reached about the bases for these judgments, and how much are they taken-for-granted in a setting, or alternatively, held up to scrutiny? More pertinently for our concerns here, how are such discursive maps developed as part of the process, and the practice, of learning information literacy?

3 The study context

As noted in §1, Lloyd [10] suggests that becoming information literate means learning to map and navigate an information landscape, but offers no detail of what this means in practice. We therefore propose that discursive mapping is occurring any time that members of a group engage in dialogue that contributes to the definition, filtering, configuration and development of an information landscape, whether or not a literal, visual representation, or map, of that landscape is one product of this dialogue.

To study these discursive mapping processes is not straightforward, however. Dodge et al [3, p. 231] note that "[g]aining access to natural, vernacular and everyday settings to observe situated mapping activities requires creative solutions and negotiation for scholars…" To set research subjects some kind of mapping task risks bringing in an artificiality to the judgments made (cf. [12]). On the other hand, *post facto* reflections on how judgments were made may not reflect actual practice. Our study has attempted to overcome these empirical, epistemological difficulties by analysing the content of dialogs that have taken place, over two years, on discussion boards in a virtual learning environment (Blackboard) on a postgraduate course in educational technology. As part of their assessment on the unit, students join small groups of 5-7 learners who engage in a series of three online discussion activities, each lasting two weeks (see also [16]), designed to promote independent, problem-based learning. There are similarities to the assessment task analyzed by [1], in which a group of 4-6 students used wikis to co-author reports in an imagined work setting, although that study analyzes only the dialogue of one of these groups whereas the corpus for our study consists of the discussions of 20 such groups, and over 1 million words of text. As well as being coded as qualitative data, this corpus was pulled out of Blackboard using SQL queries that allowed analysis of each post in terms of the identity of the poster, the time of posting and issues such as whether things like images or hyperlinks were included. For the purposes of this paper these latter methods help show when new resources are being introduced and validated by group members.

In the quotes given below, metadata are structured as follows: [year of cohort/ group identifier/number of activity], hence [15/Blue/2] means the quote comes from the discussions of the Blue group, 2015-16 academic year, during activity 2.

4 Findings

What follows are not generalizable conclusions about how students invoke discursive mapping to make sense of information, but three cases of how groups develop discursive maps of contexts *about* and *within* which they are making judgments. For more detailed assessment of the impact on learning and development of IL, see [18].

4.1 Mapping the group's digital habitat

When students begin the course, they enter a 'digital habitat' [17] that has been constructed by the course tutor, with provided informational resources such as the reading list; technological tools like the discussion boards; and an overall configuration set by structuring devices like the curriculum, intended learning outcomes and the assessment specification and marking rubric. At this starting point, this is a habitat without inhabitants, and in this respect, the same for each group. However, based on their prior experience and judgments of relevance, oriented by influences such as their own subjective understanding of tool affordances and their interpretation of how best to set up the habitat so the group can meet its shared learning needs most effectively [17], groups introduce new resources into this 'starter' habitat. These resources may be informational, and come from online sources and/or the literature, as these quotes illustrate:

> *Here is the link for the text "Knowledge for Literacy" as a reference: http://www.shankerinstitute.org/blog/knowledgeliteracy [15/Purple/1]*
>
> *In my university… to be innovative in technology or deliver teaching in a different way is questioned, not by the faculty, but by higher management who see it as not conforming to the standard norms students are used to. [15/Black/1]*
>
> *Since technologies are changing very fast, we must also relearn and readapt our own teaching practice. Mishra and Koehler say that technological knowledge is "the ability to learn and adapt to new technologies" (page 1028). [15/Purple/1]*

We see here, respectively, the provision of information via URL; via narrative and personal experience; and via academic citation.

As well as these informational resources, students introduce technological tools into the landscape. This is rare in activity 1, but after that experience, groups frequently note that the discussion boards have limited functionality, and so, through a series of informed judgments, introduce alternative resources into their habitat. For example:

> *Me, [D] and [S] just had a Skype planning meeting to think things over; here's a summary of the discussion and what we will be doing [16/Blue/2]*

Both Skype and the posted summary are resources that the group can now draw on. Other groups use different tools. For example, Padlet becomes part of the habitat configured by [15/Blue], [16/Diamond], [15/Black] and [15/Gold] but not the other groups.

Student [B] here introduces Padlet to [15/Blue]. He draws on his professional experience, and suggests associated information practices, to align the group's work with expectations defined in the starter landscape, referring to instructions given by the tutor:

> *In class I like to use padlet.com to create discussion boards and students have even used it to do group work. I've created a padlet with the information. It's a huge poster board where we can all add information. I've added all the information [tutor] has provided and a quick comment. Let me know what you think? Should we give it a try? http://padlet.com/[URL truncated]*
> **If you want add information, please add you name to posts or register (it's free) so [tutor] can view it for assessment.* [15/Blue/2]

On occasion, individuals suggest reasons to avoid particular technologies (remember, these suggestions are being made to other group members as they work):

> *The main problem I find with LinkedIn is that it's overrun with recruitment agents, so I rarely use it. Twitter is OK for some stuff, but because it's so transient I find I miss things a lot and it feels like a lot of effort to keep up with it. [16/Blue/2]*

By the end of the series of activities, each group's learning environment looks different from those of other groups and different from the starter landscape. The landscape has become a record of the judgments of relevance that have been made by individual group members. These judgments are based on the prior experience of individuals, and the ways they exhibit digital and information literacy in work and everyday life [7, pp. 137-8], but they are then validated by other group members according to their relevance for the specific, shared task that the group has to fulfil. The group learn to develop practices that help them work together as a group and that are in a dynamic, mutually-reinforcing relationship with the technologies and sources that they introduce into the landscape. As Wenger et al [17, p. 137] write: "Shared assumptions about how to use [the technologies] constitute practice."

These practices are taken forward from activity to activity without needing to be renegotiated. Groups also reflect on their prior performance and consider how the practices, technologies and resources in the habitat might be better used this time:

> *Me, [Y] and [S]… have already discuss on how we should form our thread in this forum so that it'll better organized than our previous discussion (Hehehee.. we think it was pretty cluttered). [16/Black/2]*

In each group, what is emerging is a set of shared assumptions about the landscape, and ways of navigating it most effectively: in short, a discursive map.

4.2 Mapping a simulated context

The next case shows more explicitly how groups use a discursive map to make judgments about the relevance of encountered information. In their second activity, a role-playing simulation, groups are provided with a scenario involving a fictional HE institution, "Mackenzie College", seeking to enhance its use of educational technology. Each group plays the role of a stakeholder (e.g. management, academics, IT services, students). The task parameters require each group, through consulting academic litera-

ture and subsequent dialogue, to establish a collective position on "Mackenzie's" situation, then contribute information to the management group who draft a decision that is publicized to the other groups. Each group should then respond to this document. Thus, in terms used by [15] and noted above, the task has two stages: an *orientation* stage (what is our interpretation of the scenario, what are our priorities?), then, an *analytic* stage (what do we think of the management group's draft decision?).

The provided scenario offers brief notes about issues that each group might like to consider in their discussions: in effect it is the tutor's initial discursive map of the context. But the landscape is a very limited one. The marking rubric for this assignment encourages *practices* whereby, in the orientation stage, group members must broaden their information landscape, incorporating other resources that they judge as relevant.

As a result of these searches and consequent dialogues, each group then develops their own perspective on that initial scenario. This differs from group to group. Contrast these posts, from groups playing the same role, that of the IT services department. These two groups have begun with the same *initial* information; but agreed on different priorities. Both groups discuss different technical issues (wifi for the Diamond group, the virtual learning environment (VLE) for Green); for the Diamond group, training and teaching are also considered important, but the Green group's focus is more on the students. speed and students' accessing the environment after graduation:

> *So far our ideas seem to be around: Changes in infrastructure: potential investment in wifi; Changes in teaching: potential changes in the adoption of apps as an IT team we need to look at how we could support this both through infrastructure and possible training. This might be a potential digital change agent project (students and staff working together)* [15/Diamond/2]
>
> *Questions we (the IT team) have to deal with by the end of this week: What should/can we do to make [the imaginary virtual learning environment] a faster platform? Can we get in touch with the provider and see if they have any updates coming up next year? For sure, we don't want to move into a different VLE. Is there a possibility for us to help the students maintain their access after they graduate? This might be a real satisfier for the students.* [16/Green/2]

What is significant is how this interpretation – the discursive map – is carried through into the analytic stage and used as the basis for judgments made there. The transition from one to the other takes place after the group playing the managers in this simulation announce their decision (a draft e-learning strategy for 'Mackenzie'). Groups are then asked to present a group reaction to this judgment.

This quote highlights a significant issue:

> *Hi guys, the [group playing the role of] students have posted these answers…. [detail follows]… this is good information for us to use and saves us time…. this strengthens our argument for 'going it alone' and they recognise us as being well trained* [15/Gold/2]

The basis for the judgment made in it — that the information provided by the other group strengthens the argument of this group for "going it alone" with educational technology — is authentically made, even though it *refers to a simulated context.* There is no external "reality" to Mackenzie, and therefore, no criteria against which the group

can base its judgments *except those which they negotiate and agree upon*. Through dialogue, each group has reached an agreement on certain basic informational constructs such as priorities and problems for "Mackenzie". There has developed an agreed-upon configuration of information that has subsequently become the basis for the judgments of relevance that each group makes regarding the decision posted by the "senior management". For example, responding to this decision, [R] writes:

> *Have the management integrated the librarians, the students want this and we do too. How is the new situation an improvement for us? Will it make any difference to our teaching and delivery of our courses and our research? I think we need more support from the management and more recognition.* [15/Gold/2]

[A] brings in information from the starter landscape (the provided scenario) to integrate it into the mapping (the quote indented below), then builds on it to make judgments about what is best for, and what 'happens' within, this *simulated* context:

> *we already have long experience with this issue because we manage to teach distance learners. In other words, our expertises have formed as a respond to learning process which is distance learning.*
>
> > *" Mackenzie's distance learning programmes are highly rated and are led by a team of academics/researchers who are internationally regarded as innovators in the teaching of History at a distance. "*
>
> *So, I suggest to contact with managers team to discuss the idea of introduce our experience to other colleagues either IT team or other academic team?*
>
> *[S], I see your point regarding Web 2.0 tools which is inconvenient as a learning environment, I agree with this. I think in our context Twitter and Blogs are used as strategies of e-learning.* [15/Gold/2]

[R] agrees with [A] that this will have benefits for their group:

> *this could be a good opportunity for us to improve our profile at the university and therefore to get some recognition for the quality of teaching we deliver in the department.* [15/Gold/2]

These things can be stated confidently about an unreal context because the agreed discursive map that they have negotiated has been integrated into their information landscape, and for each group, is now no less "real" than their collectively negotiated perception of the assessment task. The map has helped the group *make connections* between informational resources, and it has become *an agreed-upon basis for action* that does not need to be renegotiated and can serve as the basis for *group judgments of relevance* regarding found and offered information.

4.3 Mapping a real context

The third activity in the series, discussed in more detail in [16], requires groups to propose designs for technological enhancements to two museums, like a new exhibit, app or video. Unlike in the first two activities, the information students need here is not provided to them, but gathered on a field trip. As members do not all visit the same museum, to make a choice about which to work with, they need to share information

about these contexts within the group and discursively map them: which in this case means reaching agreement on what aspects of the museums are relevant and how these relate to the proposal they must collectively make, to succeed at the assignment task.

To configure the information landscape accordingly, students introduce and validate information gathered from the field trip. Here [C] introduces his colleagues to the museum he visited, although then suggests they discount it as a case study:

my museum was the Cu Chi Tunnels just outside Saigon. .... Unfortunately, I don't think this is a good example for the application of digital technologies for this task.... as someone who hates violence, I don't think we should go there. [15/Orange/3]

[W] brings in a relevant online resource to propose an alternative, that is then validated by a third group member:

I visited the Origins centre in Johannesburg - you can view it at http://www.origins.org.za/ [15/Orange/3]

I like [W]'s suggestion about Origins museum, so I vote to it with [C]. I have checked the website and it sounds interesting. [15/Orange/3]

Past experience is also drawn on (this from a different group):

Before moving to Asia I lived and worked in Europe at [a contemporary art museum]. I was part of the education department creating and imparting guided tours. [15/Black/3]

All group members begin to contribute to the judgments needed, around information and technology, that meet the parameters of the design task. This even for museums they have had no personal experience of (for more detailed discussion of this see [16]). Here, [B] outlines the features of their field trip he considers relevant, thus, suggesting elements to plot on the emergent discursive map:

What about the lighting and layout [of the museum]? Was there a set path? Were you guided along ... or could you move around freely and revisit other exhibits?...Can I ask a few questions..... [15/Blue/2]

[U] states that the political message of a museum in Africa is rejected by local people and not grasped by tourists:

I think [the museum] have got a good marketing ability or strategy that is why people keep coming there as a tourist centre. Basically i think that foreigners are the ones who will believe their message because some of them are naive of the political situation in [African Country] right now. [15/Diamond/3]

Validation of this follows, with acknowledgement from other group members that this changes their view of the museum:

I've googled and found this website: [war museum name]... which I think is the official website of the war museum. I found your point of view very interesting when you said that only foreigners are likely to believe the message of the museum.... I can imagine that if I visited the museum... I would definitely take the message it tries to convey for granted, but having insider knowledge as you do can unveil many different facts that are not very obvious. [15/Diamond/3]

The group then goes on and makes judgments against this revised map:

To be honest, based on what [U] describes I don't think that the one she visited could be a good example for our task: there is too much bias and political issues involved...

so how can we apply technology in a Museum with all those barriers? [15/Diamond/3]

This quote, from activity 3, shows how this student is aware of the process, the importance of developing the map *before* making judgments about the proposed solution:

we need first share our experiences about the field trip to museums as informal learning environments explore how these museums communicate with users or visitors? and how the contents or subject matter presented?.... let us share our experiences here and from that we can think and list the important aspects of our design. I think this is a good starting point! [15/Blue/3]

The students are using a non-visual, but agreed-upon representation of a context, unique to each group, as the basis for judgments. As we write in [16, p. 82], group members have: "collectively (re-)organised their information landscape to allow each other to make critical and informed judgements about contexts… that they had no experience of prior to the start of the dialogue."

5 Conclusions

We suggest that information literacy is manifested explicitly in this kind of dialogic work, where group members make collective judgments about how new informational resources will be positioned in their information landscape. This is more than just an 'understanding' of a situation: as these agreed-upon judgments have been used as the basis for further judgments about the relevance of information. A dialogic artefact of some kind has been created: a discursive map, unique to each group.

These are not mature maps, of the sort applied in workplaces (implied throughout [10]). Such discursive maps will be much more implicit, the bases for judgments less directly articulated. Here, the visibility of the dialogue is due largely to the fact that these processes are subject to assessment, and the impact this has on how 'free' students are to engage in information practices is obviously significant. The question of whether the agreements mentioned above are inclusive of all members of groups or whether some members conceal their true judgments and/or protest by withdrawing from the dialogue is also an important one. Both are issues beyond the scope of this paper but will be handled in [18].

Nevertheless, in each case reported above, both individual members and the group as a whole are able to make informational judgments based on aspects of a context that they could not have known about prior to the start of the activity. Through the dialogues that have taken place, these students have learned to apply *new* criteria for judgments about found information. They have, in short, shown evidence of having learned to map their information landscape: and to use these maps as the basis for bringing in new resources into that landscape, making judgments about their relevance, and placing them in relation to the other resources and the practices which are already there.

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Improving tagging literacy to enhance metadata and retrieval for open educational resources

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Abstract. The growing amount of open educational resources and the diversity on learning and teaching makes social tagging attractive for the educational field. Social tagging services become valuable in contexts where users can support the enrichment, sharing and management of relevant resources. Potential benefits are the enrichment of incomplete metadata, which is crucial to offer effective retrieval services. However, user tagging skills need to be fostered if users shall effectively contribute to the idea of collaboratively sharing and creating educational resources. We aim at fostering user tagging literacy. We analysed tags and user behaviour from a German referatory for educational resources. Our results show that users apply specific tags for their learning and teaching resources that we tried to assign to additional tag categories. Based on our results, we suggest improving such services with a more user-centric approach that supports the development of user competencies on social tagging. We will contribute to a better understanding of user tagging behaviour in services focusing on educational resources. On the one hand, this will help us to improve current services. On the other hand, we are able to build services that foster tagging literacy. This will be beneficial for users, which will be able to better manage their digital resources, and for infrastructure providers, which can apply user-generated data to improve their services.

Keywords: tagging literacy, open educational resources, user behaviour

1 Introduction

Digital educational resources allow easy access and storage for relevant learning and teaching material. Openly licenced – for example with a creative commons licence – those open educational resources (OER) allow every user to retain, reuse, revise, remix and redistribute them [1]. OER include all kinds of resources, like learning, tools and implementation resources, which have diverse granularity levels, i.e. OER can be single learning objects like an open textbook or whole learning courses like MOOCs [2]. A major aspect often underestimated is searching and finding OER. Repositories or referatories for OER offer basic search functions [3–5]. More advanced systems could improve OER retrieval and usability to allow users to find proper resources for their diverse needs. To further improve retrieval, digital resources need to have complete and structured metadata. An OER search service would profit from rich and properly-described metadata fields, which are the basis to establish effective filter

functions to retrieve OER. LOM and LRMI are two common standards for OER, but there exist many variations. For some services, editors professionally add and manage metadata while applying common vocabulary standards. However, considering the financial capacities needed and the growing amount of digital resources, getting support from web users might be crucial. A challenges is that those actors assign any terms to describe their relevant resources, e.g. via tagging, and most of them are not aware of any standard. If users become more competent in tagging, they can contribute to completing missing OER metadata that improves retrieval.

The following paper aims at improving OER retrieval while fostering users tagging literacy to make users able to contribute to OER metadata enrichment. A first step is to get insights into user tagging behaviour. Based on the results from tagging data in a German OER referatory, we suggest options to improve an OER tagging and retrieval system that fosters positive user tagging behaviour to be valuable for the proposed goals. The research questions are:

- Can we classify tags of educational resources according to existing tag categories to distinguish relevant tags for enriching metadata and improving search?
- In which way can a tagging service effectively support users in improving their tagging to support metadata enhancement and retrieval?

We will first relate to literature on social tagging and tagging literacy, before we introduce our methodological approach and referatory we refer to. Section 3 presents the results. In the discussion section, we give recommendations for enhanced tagging literacy within an OER tagging service, before we conclude on our research.

Social tagging or collaborative tagging is the process to enrich digital resources with the help of web users: users add relevant resources (bookmarks) to a service and describe them with freely chosen keywords (tags). Tagging happens in a social environment, usually shared and open to others. Those social bookmarking services have a folksonomy structure with user-bookmark-tag relations [6], i.e. “folksonomy is created from the act of tagging by the person consuming the information” [7]. Tagging is „an act of organizing through labelling, a way of making sense of many discrete, varied items according to their meaning“ [8]. Users benefit in different ways. They describe their resources with tags to make them findable and distinguishable from other resources. As well, they can search further relevant resources via tags from all users of a system. Thus, all users collaboratively support each other in the management of their resources. Social tagging can be beneficial when there is too much content to classify or there are no editors that take the ‘librarian’ role [8]. Besides, web services use tags to automatically index resources.

Enabling users to freely index their resources without having to care about guidelines or terminologies causes problems because tag collections lack common vocabulary. Moreover, many tags show grammatical or typing errors, or seem meaningless for those who have not applied them. Services that want to use tags for resource data enrichment or user recommendations need to handle various language requirements such as multilingualism, semantic and morphological problems [9].

To overcome those challenges and benefit from social tagging, users need to become competent in tagging. They need to learn to use tags that describe resources in effective and complete ways. Moreover, studies showed that there are different types of users, describers and categorisers [10, 11]. Describers generally have a broad tag vocabulary, including many synonyms. Categorizers rather apply tags for structural purposes, like navigating through their resources. They generally do have fewer synonyms on their tag vocabulary. Identifying those user groups could help in predetermine tags for possible metadata enrichment, for example describers' tags might be relevant to find new formal vocabulary terms [11].

We see tagging literacy as part of information literacy [12]. The Association of College & Research Libraries describes information literacy skills within six frames [13]. They include dispositions like "see themselves as contributors to scholarship rather than only consumers of it;", and "value user-generated content and evaluate contributions made by others" [13]. The DigComp 2.0 framework formulates similar digital competencies including "to use digital tools and technologies for collaborative processes, and for co-construction and co-creation of resources and knowledge" and "to share data, information and digital content with others through appropriate digital technologies" [14]. Social tagging is a process of co-creation, in which all users support each other in their resource and data management and beneficially contribute to a folksonomy structure that supports the retrieval of relevant resources.

As such, there exist diverse strategies to improve tagging literacy and support users in their tagging activities. For example, a system may allow users to re-edit or delete tags, and offer formatting guidelines or checklists [15]. A tagging interface could hint users to tags that are informationally powerful [16]. A service may as well propose tags used by others in similar contexts [11]. Finally, studies investigated the use of tag clouds and found them to be a positive support for finding suitable resources: "The user can search and browse science education resources using an appropriately formatted tag cloud produced by the tags that all users of the tool have offered" [11].

To help users to become tag literate, we first need to get deeper insights in how users apply tags. Categories help to distinguish between different meanings of tags and their purpose. There are different approaches on how to categorise social tags. One approach [8] differs between seven several functional tags: Identifying what (or who) it is about, identifying what it is, identifying who owns it, refining categories, identifying qualities or characteristics, self-reference and task organizing. Other categories are be "foreign language" [17] or "location" and "time" [18]. Lawson differs between objective and subjective social tags [19] and Wu between topical and non-topical tags [19]. Gupta et al. [20] base their tag categories on those approaches and come up with eleven categories. In our study, we refer to those categories.

OER services can benefit from user tagging activities in different ways. First, the growing amount of OER requires cost-efficient solutions to enrich OER metadata. Metadata is inevitable when OER services want to offer effective search function to users to be able to find their most relevant resource. Second, tagging OER allows users to describe their relevant resources according to their own purposes, which supports individual learning and teaching. Standard vocabularies might be insufficient to describe the diverse user needs. Third, tags allow a better description of new and in-

novative resources as structured vocabularies might become archaic. Regarding the innovativeness of OER and learning and teaching concepts in general, tags might allow for an enrichment of those vocabularies. So far, a few studies analysed user tagging for educational resources [11, 21], mainly with the purpose to enhance metadata and give resource recommendations [22]. This paper does not focus not on the techniques of a system, but wants to analyse user tagging behaviour to suggest a concept to improve user literacy.

2 Method

We categorized user tags and had a closer look at user behaviour considering describers and categorizers. We used tags from our service *Edutags* described below, where we have direct data base access. We collected our data via SQL queries on October 19th, 2018 and December 13th, 2018. We have two data sets, a) all tags, and their number of times used by any user of the service, b) users-resource-tag sets, where a single user bookmarked a resource for the first time, i.e. excluding OER automatically collected by the system (see 2.1) and excluding bookmarks that other users bookmarked before to not influence tagging behaviour.

Data set *a* was the basis for categorising our tags. Within *a*, we did minor data cleaning and deleted the automatically generated tags *import*, *Import, WONG-Import* and *import_delicious*. We aimed for categorising 10 % of the most used tags within the service and checked the 1196 mostly used tags. We merged synonyms and corrected minor grammar errors. We also checked on acronyms, words that occur in German and English, in singular and plural forms, different spelling and duplicates. That resulted in 984 unique tags and this makes up about 10% of the total number of tags that have been used at least twice (Table 1).

Table 1. Number of tags and categorized tags from data set *a*.

Description	#Number
Total number of tags	27084
Number of tags used > 1	9843
Total number of categorized tags	984

Table 2. Unique numbers of data set *b*.

Description	#Number
Bookmarks	14793
Tags	885
Users	955

Data set b was the basis to assign a larger tag set to categories and look for user describers and categorisers. We deleted the automatically generated tags import, Import, WONG-Import and import_delicious. In addition, we deleted user-bookmark-tag sets,

where a user or tag was missing. This resulted in 73425 tags (not cleaned), 17803 single bookmarks, and 1194 single users. Applying the manually assigned categories from data set a, we received a sub set of b (Table 2) that includes all resources with tags that could be assigned to categories. Note, we did not have any information on the tagging order of a single resource.

2.1 Edutags – a digital resource referatory

Edutags is a reference service for digital educational resources, established 2011 [4]. *Edutags* focuses on teachers and wants to support them in seeking teaching materials and teaching ideas. Users can search for resources and assign them as individual bookmarks in their profiles. *Edutags* applies two ways of collecting OER references. A crawler automatically collects OER and their metadata stored by services from ten cooperating partners. Additionally, users are able to add their own resources to the service. When users add a resource, they must add at least one tag to describe their resource. Hereby, they see a list of their own tags used before. Additionally, users can comment and rate bookmarked resources. Users can search for a resource via a tag cloud, where the colour of the tag terms refers to their assignment frequency.

2.2 Problems with tag categories

We could not explicitly assign every tag to a single category. In most cases, we lacked context and could not identify any tag meaning. In some cases, we could identify the exact meaning by looking more closely at the attached resource. Another occurring problem is two-word tags like *biology lesson* or *English lesson* that are subject tag and domain tag at the same time. In our study we classified those tags as subject tags (Table 3). Other tags included a name, date, place or a resource type and we were unsure if those describe the context or the content of a resource. We categorised these kinds of tags as factual tags. Subject tags (like school subjects) are helpful as our results indicate, but the granularity of subject distinction is arguable. In our study, we assigned tags like *biochemistry* as subject tags and applied the rule that they are subject tags if the tag consists of only one word. We as well had several acronyms, for which we could not find the right meaning and put them into non-classifiable tags. At last, there exist tags that compound two or more words and meanings, like *math primary school*. It is a combination of a subject tag and a domain tag. So, we decided that one tag could be a member of more than one tag category.

3 Results

Our used tag categories are based on the tag classification by [20]. However, our 984 tags represented only four of the eight categories (first four in table 3). Instead, we realised that users applied more explicit descriptions for educational resources. Many tags referred to school subjects, school types, types of materials and licenses. We did not assign them to content-based tags because we assume that users want to be more

specific on their resource content. Thus, we added four additional categories, which are subject tags, license tags, resource-type tags and domain tags (Table 3).

Table 3. Tag categories based on [20], with four additional OER categories.

Tag category	Description
Content-based tags	These tags identify the concrete content of the resource
Ownership tags	The ownership tags determine who owns the resource. We merged this category with context-based tags [19] that describe the context in which the object was saved or created. Example: *coer13* (workshop).
Factual tags	The factual tags identify facts about an object, for example people, concepts or objects. Most of our tags are geographical.
Attribute tags	These tags are inherent attributes of an object, which might describe qualities or characteristics, like *current*, *mobile*.
Subject tags	They characterise school subjects and disciplines like *maths*, *biochemistry*.
Domain tags	They describe the domain of the resource, which include the education level (*primary*, *secondary*) and class level.
Resource-type tags	They describe all kind of learning material and media type. For example: *worksheet* or *video*. Some of the resource type tags are more specific than others.
License tags	This tag describes the creative common license of the resource.

Fig. 1 shows the distribution of tag categories from data set *a* (left chart). 0.79 % of existing tags could not be assigned because we could not determine the meaning. Of the 984 unique tags, 27 tags were assigned to two categories and one tag to three. Thus, the distribution of categories is based on 1012 tags. Fig. 1 as well shows the distribution of tag categories from data set *b* (right chart). There are no noticeable differences in the overall distribution of categories. However, the newly applied cate-

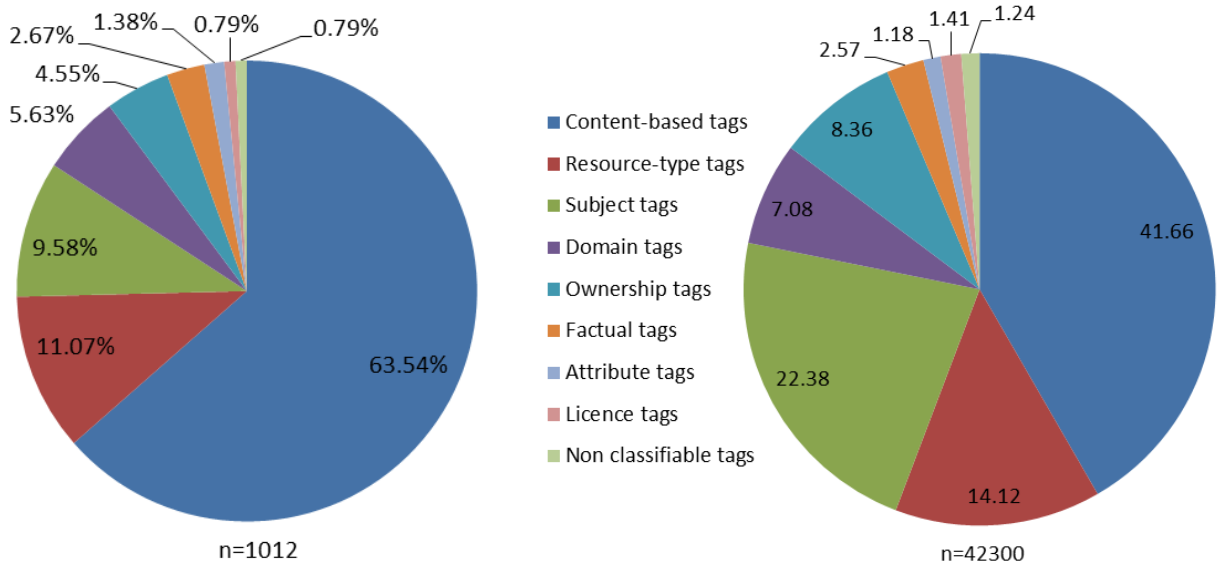

Fig. 1. Tag category distribution from data set *a* (left) and data set *b* (right).

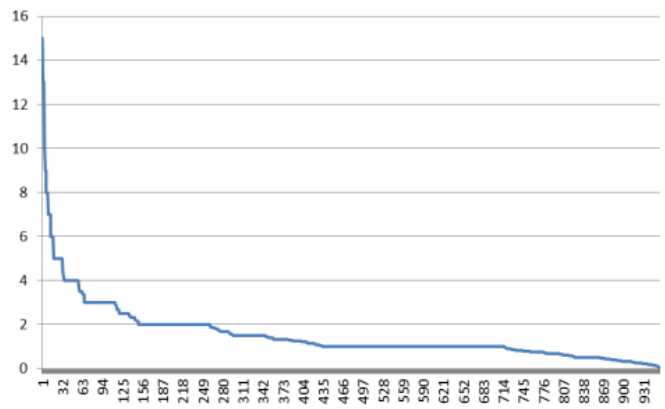

Fig. 2. Tag/resource ratio per user, data set *b*.

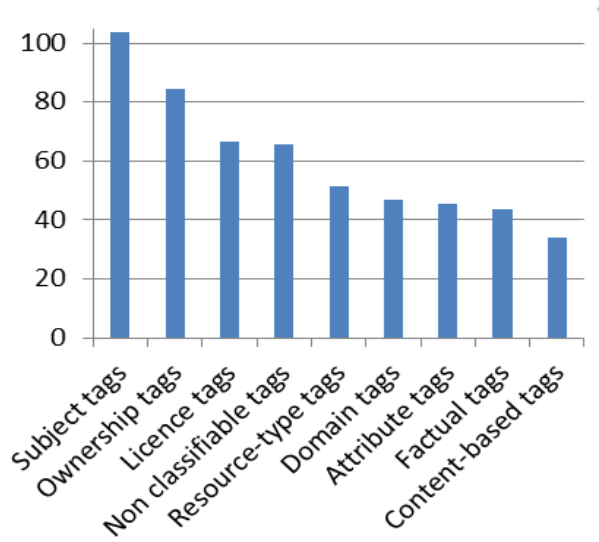

Fig. 3. Average number of users assigning a common tag in a category, set *b*.

gories subject tags and resource-type tags have a higher percentage, which might stress their importance for users.

On average, users assigned 2.8 tags to a resource. Fig. 2 shows the tag/resource ratio of a single user, which can be an indicator of describer users, who would have a higher score according to the variety of tags they use [10]. That means, users on the left hand side of the diagram in Fig. 2 could be identified to look for new metadata vocabulary [11]. Another hint of finding relevant metadata vocabulary is the number or average number of users that assign a single tag. Here, results show that on average many users assign tags from our additional OER categories (Fig. 3). Tags applied by a high number of users can be considered for new metadata vocabulary, e.g. to expand determined values in specific metadata fields.

4 Discussion

Tags for OER show classic categories from the research literature. However, users seem to need more additional categories that specifically describe the purpose of OER within learning and teaching. We added four more tag categories that describe educational purposes and our data shows that users often apply tags from those categories. Those categories allow for a finer distinction between resources than having a single content-based category, and users are quicker in finding relevant educational material.

We tried to assign our tag categories to the LOM-CH metadata standard (Table 4). Not all tag categories exactly match a unique field, e.g. factual tags might fit into three fields. However, it is possible to assign tag categories to current standard metadata fields. Current OER repositories already offer some relevant search filters, e.g. Elixier (bildungsserver.de/elixier), a service for educational resources, which offers filters like keywords, education level, resource type and license. This shows a great match with our tag categories. A challenge for users might be the different field values applied by services, like e.g. in the resource-type category or with regard to values for media formats. Here, it would be desirable to agree to common values. Improving tagging literacy is a process that needs continuous fostering. Users need to be aware of the benefits that come with appropriately assigned tags.

Table 4. Tag categories assigned to existing LOM-CH fields.

LOM-CH	Tag Category	Example
1.4 Description	Content-based tags	Fractional arithmetic
5.2 Learning resource type	Resource-type tags	Worksheet
5.8 Difficulty	Attribute tags	simple
1.6 Coverage 2.1 Version 2.3 Contribute	Factual tags	Brazil
9.1 Purpose 9.2 Taxon Path 10.2.1.4 Scope	Subject tags	Biology
5.6 Context 9.1 Purpose 9.2 Taxon Path 10.2.1.4 Scope	Domain tags	Primary school
6.2 Copyright and other restrictions	License tags	CC-BY-SA
2.3 Contribute	Ownership tags	DBS-Wiki-KW

As such, we suggest implementing and evaluating the following functions for an OER service that allows tagging.

- Recommend OER related tag categories to users to make them aware of tagging options. A system could ask users to assign concrete categories during the book-marking process.
- Guide users through their search process. A service could hint users to relevant filters to make them aware of search options.
- Show users their own tags and allow them to edit those. Users would be able to correct typing errors, or merge synonym tags [12].
- Show users the most relevant metadata fields of OER. This makes users aware of missing metadata and motivates them to add additional tags.
- Show users the user network and its activities. This might foster user collaboration and awareness of the benefits of collaborative tagging.

Those suggestions focus on a user-oriented approach that supports user needs and

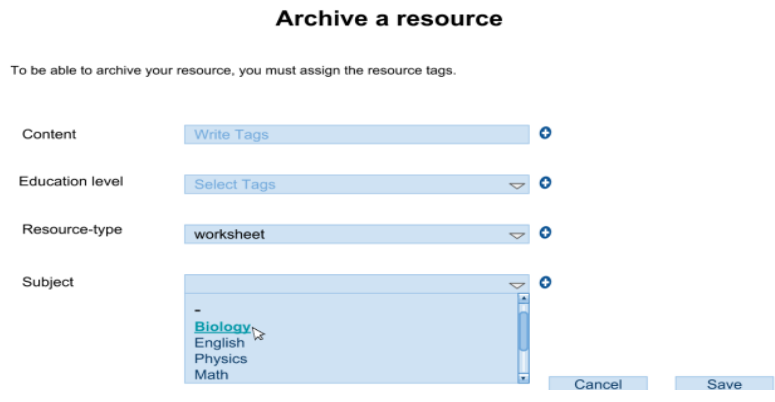

Fig. 4. Example of a tagging interface.

intentions. This will help users developing relevant competencies to be able to self-manage OER sharing and retrieval. We will do further research on evaluating those proposals via designed web interfaces (Fig. 4). Other studies as well show promising results with regard to hedonic features [23].

5 Conclusion

The growing amount of OER as well as their diverse context-based and subjective purposes makes social tagging attractive for the OER field. However, to overcome challenges and get the most beneficial user support, we argue that OER services need to foster user tagging competencies. We analysed tags to identify user tagging behaviour. Users applied specific categories to better describe the educational purpose and context of their resources. We therefor proposed service functions to foster user tagging and improve tagging competencies. We aim at designing an exemplary service interface and first evaluate it with regard to its design and usability aspects. Such an established system would as well allow assessing changes in user tagging literacy.

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How librarians can engage citizens to use open access contents and open data as source for fact-checking

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Abstract. This paper describes the *BiblioVerifica* blog, which is an attempt by librarians to fight misinformation by using media and data literacy, engaging citizens as awareness users of the social networks, chats and blogs.
BiblioVerifica aims to be a public engagement project based on information literacy practices, implementing tips and tricks about search tools, reliable sources, verification strategies. This non-profit initiative promotes fact-checking based on open resources as data, journals, tools, etc.

Keywords: public engagement, fact-checking, misinformation, information literacy, open access.

Introduction

Today, in a world where everyone can share contents and check the news on social media, the relevance of evaluating information is more apparent than ever.
The *BiblioVerifica* blog aims to be a public engagement project based on information literacy practices, in order to develop public understanding of science [1].
BiblioVerifica's editorial staff [2] supports citizens with the information literacy 'antidote', by realising recommendations and actions to enhance critical thinking skills, the key competences to address them - behind confirmation bias - in the information landscape.
The goal of the blog is to encourage every citizen to do fact-checking, sharing librarians tools, tips and tricks, as the IFLA's infographic "*How to spot fake news*"[3]: any user can transform themselves into a debunker, without political proposal or self-produced data, by checking news through reliable open data and open content (i.e. OAjournals/books).

1. Nine practices of public engagement

In 2017 *BiblioVerifica* started to propose its practices to involve citizens.

- **Fostering partecipation in public consultation #tacklefakenews**
  Librarians foster citizens to answer to the public consultation "Tackle Fake news" [4] promoted by the European Union to create strategies against false news.
- **Hoax Oscar**
  The blog's followers propose some fake news for nomination as the "Hoax Oscar" [5]). Then all blog users can vote on the best hoax, between *BiblioVerifica day* (25th March) and International fact checking day (2nd April).

- **World Book Day and Copyright 23 April (UNESCO)**
  Taking into account UNESCO initiative [6], all *BiblioVerifica* followers can recommend books for fact-checking, data journalism, debunking, information and media literacy. The blog begins a platform for sharing book titles, 'reversing' the paradigm of information literacy, by becoming citizens into a source of reference.
- **The Sustainable Development Festival**
  Among the events of the Festival of Sustainable Development promoted by Alleanza Italiana per lo Sviluppo Sostenibile (ASVIS), the seminar "Sources, Tools, Sustainable Strategies to debunk #fakenews" [7] at *Vilfredo Pareto* Library, University of Rome 'Tor Vergata' is proposed. Students are engaged in debunking tools, tips and tricks.
- **Tutor civico vs fake news - Antico Caffè Social**
  In Ariccia, a town near Rome, citizens partecipated in a discussion with journalists Fulvio Benelli and Cristiano Barbarossa (Discovery Channel Italy) about hoaxes and misinformation on TV and social media at the bar Antico Caffè Social [8].
- **BiblioVerifica Italy Olympics**
  A contest was created for our followers based on self-assessment quizzes[9]. Every citizen have been immediately received the point scored by quiz, detailing correct / wrong answers, showing public ranking of the participants in real time.
- **BiblioVerifica's School**
  Within the "Digital Citizenship Project" developed in the middle school "IC Marianna Dionigi " (Lanuvio - Rome), tools and tips for fact-checking were explained. The students played games [10] and watched videos about misinformation and fake news, showing the IFLA infographic and "The Manifesto of Non-Hostile Communication" [11].
- **CrowdSearcher.cloud**
  During Open Access week 2018, the international blog *CrowdSearcher.cloud* [12] was set up. This is a new interactive space to engage European and international debates by advocating the dimension of openness.
- **Customizable 2019 calendar**
  In December, *BiblioVerifica* invited librarians and archivists to share events for the following year about information and data literacy, resulting in a creation of a public calendar [13] downloadable by citizens.

Conclusion

The *BiblioVerifica* is an ongoing conversation with citizens, centering around a specific fact or questions, by supporting search in the media that they consume. The focus of these engagement practices is to foster citizens to develop debates and analytical reasoning in the interaction and processing of information, without political propaganda or biased ideology.

Librarians play a facilitating role in supporting citizens in order to verify facts and news using good practices, sharing collaborative space and tools, focusing on reliable

open resources. It means promoting fact-checking to fight the misinformation, sharing strategies based on principles of accuracy, traceability, transparency, accountability, indipendence and impartiality.

This blog has been created, designed and developed by the librarians of the Vilfredo Pareto Library of the University of Rome “Tor Vergata”. Owing to its contents, it is one of the initiatives with which this library intends to play an active role in the processes of training and education for long-life learning. The Library embraces the Third Mission of University[14] and the Sustainable Development Goals of the United Nations 2030 Agenda (specifically SDGs 4.6 /16.10) [15] for economic, environmental and social development.

Take action now to transform our world!

Information Literacy Online – An Erasmus+ Project to improve students' competencies

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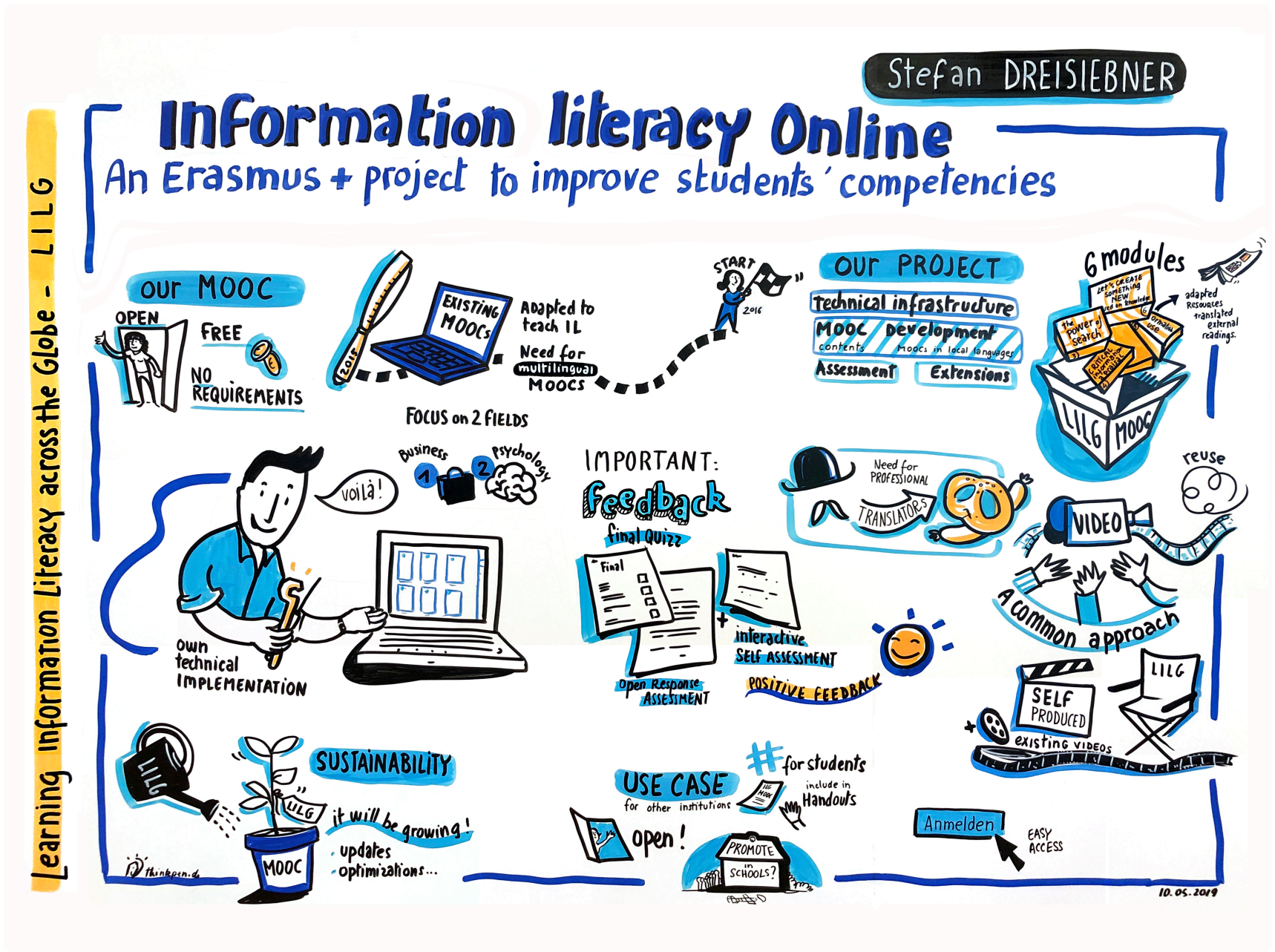

The ILO MOOC concentrates on information literacy elements which are relevant for all subjects/disciplines. As IL also covers subject-specific elements, the project demonstrates the extension of the 'generic' information literacy MOOC for two disciplines: Business Administration and Psychology. An innovative approach of the MOOC is be the implementation of a technology-based assessment component which allows students to get feedback on their learning success.

A special aspect of the project concerns offering this content to six European cultural and language groups: English, German, Spanish, Catalan, Slovenian and Croatian. By addressing three of the largest language groups in Europe, the MOOC will be available to many citizens with different native languages. Moreover, it will be one of the first MOOCs available in Slovenian and Croatian and as such provide a new innovative model for MOOC development in these two language areas. The multilingual approach will not only consider formal translation but also cultural-specific differences in the various realizations.

This talk will give an overview of existing MOOCs on information literacy and what makes the ILO MOOC different. It will offer insights into the project background, project structure and content framework. A special emphasis will be on the demonstration of the ILO MOOC and the accessibility of the learning content. Finally, it will show how other institutions might use the ILO MOOC.

The keynotes and panels are not available in printed full text. They can only be followed by the movie recording which can be accessed at informationliteracy.eu/conference/ .

Interactive learning technologies

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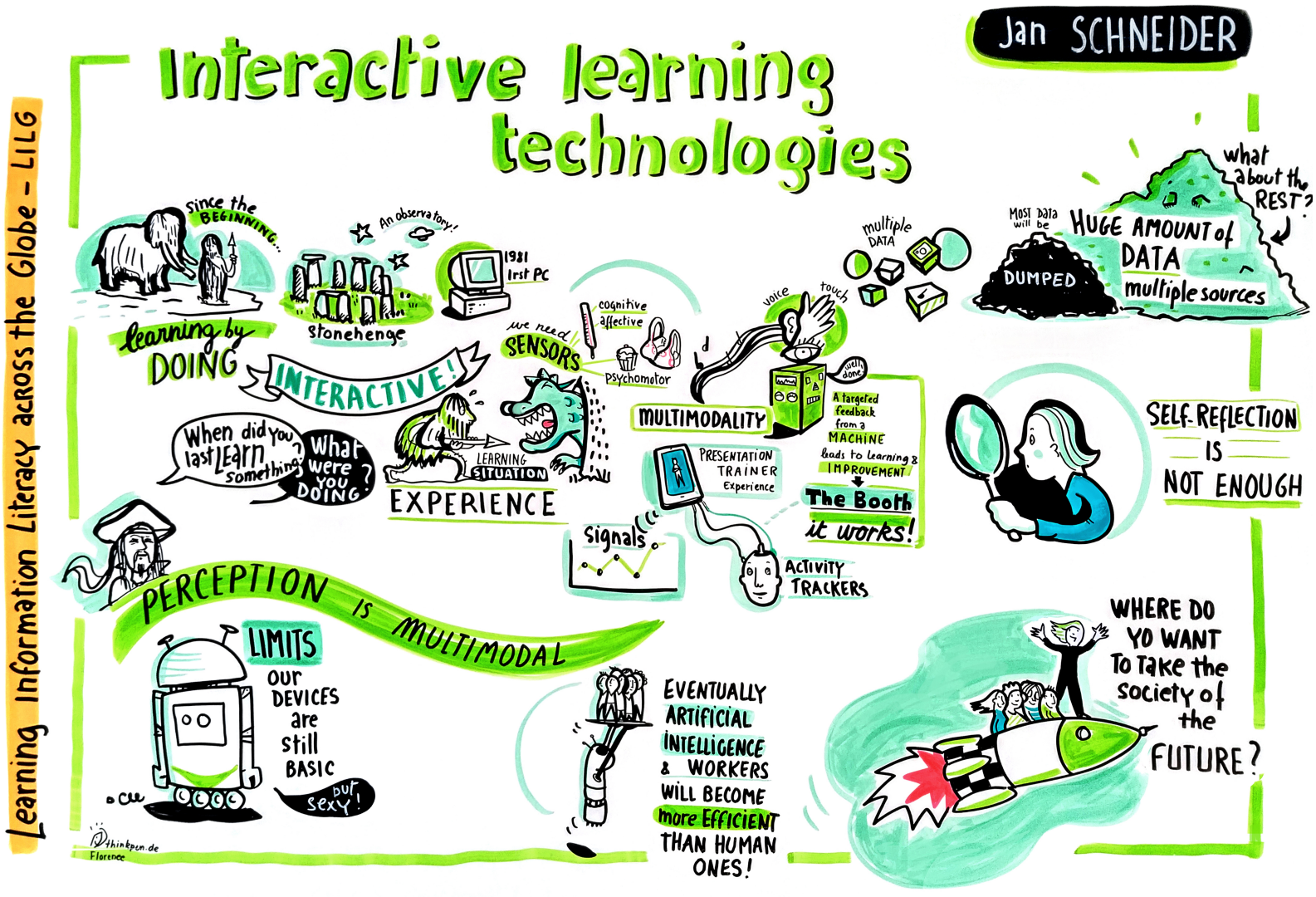
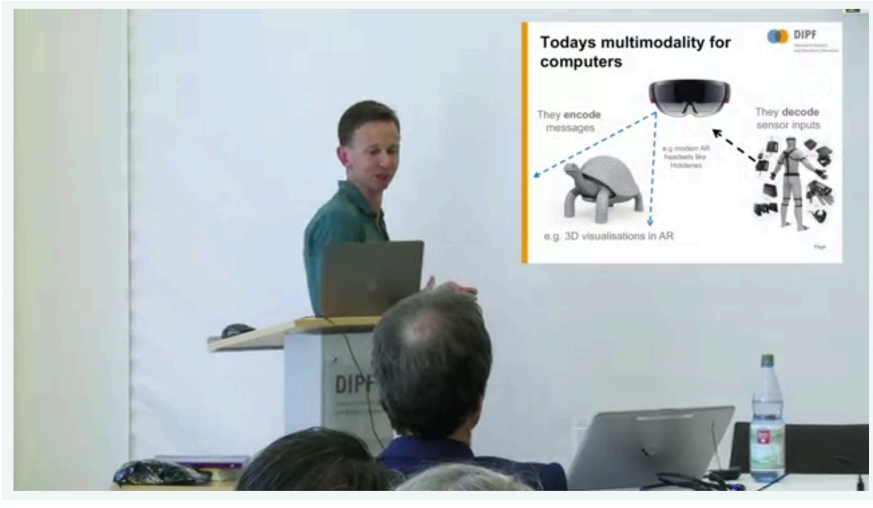


Nowadays, thanks to mobile technologies virtually all information in the world is at the reach of our hands. However, mere access to information is not equivalent to learning. Practice and feedback are some key aspects to acquire competencies and become proficient in any type of skill. Tutoring systems appeared to provide learners to receive feedback while practicing their skills. Traditionally these tutoring systems worked only for tasks that could be performed while interacting with a desktop interface. In recent years, sensor technologies have become available to the general public. Sensors can be used to unobtrusively capture the learner's environment, physiological state and performance opening the possibility to create tutoring systems for any type of learning activity.



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Developing Metaliterate Citizens: Designing and Delivering Enhanced Global Learning Opportunities

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Abstract. This paper explores metaliteracy, its importance in today's information environment, the impact that it has had on a major model of information literacy, and the flexible open resources that are available for incorporating it in the teaching and learning of any discipline. Metaliteracy is a pedagogical model for thinking and knowing in the open age of social technology that is both connected and divided. Metaliterate learning is advanced across academic disciplines through teaching and learning situations that support several principles of metaliteracy such as self-direction, collaboration, participation, and metacognitive thinking. Concomitantly, the design of innovative, collaborative, and open online learning environments, based on the metaliteracy goals and learning objectives, offers significant potential to develop self-directed global learners through the application of this unified and collaborative framework. Members of the Metaliteracy Learning Collaborative have created several technology-mediated resources for teaching metaliteracy, including: a digital badging system, four metaliteracy-focused MOOCs (two with wrap-around credit courses), and a forthcoming learning module for students making the transition from secondary to post-secondary education.

Keywords: Metaliteracy, Open Pedagogy, MOOCs.

1 Introduction

This paper explores metaliteracy, its importance in today's information environment, the impact that it has had on a major model of information literacy, and the flexible open resources that are available for incorporating it in the teaching and learning of any discipline.

Metaliteracy is a pedagogical model for thinking and knowing in the open age of social technology that is both connected and divided. While it originally grew from a need to address gaps in the extant American Library Association definition of information literacy, it has developed into an overarching literacy that has the potential to enable learners to grapple more effectively with today's fraught information landscape.

The creative potential for producing and sharing information in linked social communities has been challenged by the proliferation of false and misleading information in a post-truth society. Many social media applications are driven by proprietary interests and oftentimes foster partisan communities that have contributed to a lack of editorial responsibility, ambiguous notions of expertise, and highly divisive discourse. These post-truth challenges require the development of critical consumers of information who evaluate resource bias while reflecting on their own preconceptions. Furthermore, this complex and conflicted environment necessitates preparing responsible and ethical information creators and sharers of verifiable content who work together in a community of trust.

Metaliterate learning is advanced across academic disciplines through teaching and learning situations that support several principles of metaliteracy such as self-direction, collaboration, participation, and metacognitive thinking. Concomitantly, the design of innovative, collaborative, and open online learning environments, based on the metaliteracy goals and learning objectives, offers significant potential to develop self-directed global learners through the application of this unified and collaborative framework.

The Metaliteracy Learning Collaborative is a team of faculty, librarians, and instructional designers, with student contributions that has created several technology-mediated resources for teaching metaliteracy. This collaborative team of educators has further developed the metaliteracy model while building a range of open tools that support open pedagogy for applying metaliteracy, including: a digital badging system, four metaliteracy-focused MOOCs (two with wrap-around credit courses), and a forthcoming learning module for students making the transition from secondary to post-secondary education. These resources will be described in more detail later in this paper.

2 Metaliteracy

Metaliteracy is a reframing and reinvention of traditional skills-based definitions of information literacy that advances reflective and empowered approaches to teaching and learning. [11][14][16]. The *meta* prefix in metaliteracy intentionally invokes metacognition as initially defined by Flavell to encourage learners to think about their own thinking while taking charge of their learning through self-regulation [7, p. 908]. The idea of a metaliteracy is that learners continuously reflect on their own thinking and learning practices to define effective strategies for self-directed knowledge acquisition. There is also a second connotation for *meta*. Derived from the Greek, *meta* means "after." Metaliteracy is what is needed after, or beyond, the basic literacies of reading and writing have been attained. Metaliteracy prepares individuals to be informed consumers and responsible producers of information in a variety of social communities, including, but not limited to those mediated by technology. This approach shifts the emphasis from simply searching and retrieving information to collaboratively producing and sharing it as responsible and contributing metaliterate citizens.

The evolution of information literacy is evident in the Association of College & Research Libraries' *Framework for Information Literacy for Higher Education*, the guiding document for information literacy in academic libraries in the United States. Metaliteracy was a key influence when the *Framework* was being developed; the Framework drew upon the overarching nature of metaliteracy, the learner role of producer of information, and the four learning domains, particularly metacognition [1]. Thus, metaliteracy's impact has been extensive in the realm of practice. Additionally, the influence of metaliteracy is demonstrated by citations from scholars in a range of fields. For instance, Google Scholar lists 401 citations for the initial article about metaliteracy [14], 66 for the second [11], and 136 citations for the first book on the topic [16]. These references, along with two edited books about this model provide evidence that metaliteracy is influencing the work of others. Both *Metaliteracy in Practice* and *Metaliterate Learning for the Post-Truth World* [15] feature chapter authors outside the field of Library and Information Science (LIS), demonstrating wide disciplinary interest in the metaliteracy framework.

As illustrated by the following figures, metaliteracy is an integrated model that spurs the development of the metaliterate learner through specific learner characteristics, the four domains of learning, and empowered learner roles, all reinforced and enacted through the metaliteracy goals and learning objectives.

2.1 Metaliterate Learner Characteristics

The characteristics of the metaliterate learner (Figure 1) define the essential traits that individuals possess and aspire to through metaliteracy in praxis. As metaliterate citizens in a post-truth society, individuals must be **informed** consumers who evaluate the authenticity of information and carefully investigate resource bias while reflecting on their own preconceptions. Metaliterate individuals are **collaborative** learners who understand the value of working together in social environments to achieve common goals. As active learners in social spaces, metaliterate citizens are **participatory** as thoughtful and consistent contributors to their communities while striving to reach across partisan divides. As noted previously, metaliterate learners are **reflective** in practice, thinking about their own thinking and taking charge of their own learning strategies. This meditative approach allows for new insights and the ability to identify gaps in knowledge that are addressed through self-directed initiative.

As responsible members of social environments, the metaliterate learner is **civic minded** and civically engaged to make a difference through constructive contributions to local and global communities. Since many social spaces are mediated by technologies that always change and evolve, the metaliterate learner is **adaptable** to shifting technology environments. This requires doing so in a critical way to continuously investigate the societal impacts of systems and platforms and the potentially negative or unforeseen implications for individuals and groups. Metaliterate learners are **open** to new learning situations as individuals and in collaboration with others. Metaliteracy is

an open and evolving framework that advances open learning and open pedagogy to reinforce the collaborative production and sharing of new knowledge. At the center of this process is the learner as producer, the enactment of metaliteracy through the **productive** characteristic. The development of this characteristic in particular empowers metaliterate learners to take on a range of interrelated roles.

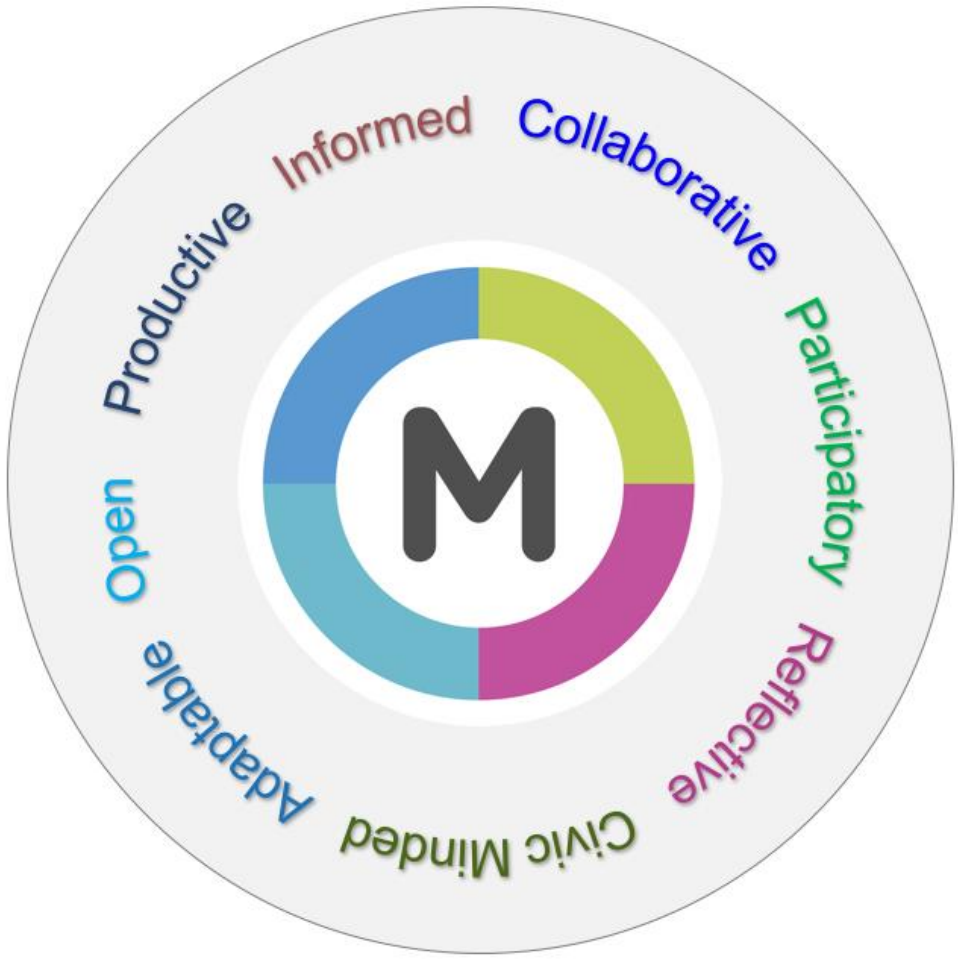

Fig. 1. Metaliterate Learner Characteristics (Source: Mackey & Jacobson 2018, p.17)

2.2 Four Domains of Metaliterate Learning

Metaliteracy's reinvention and reframing of information literacy involved thinking expansively about the learning domains essential for learners with the characteristics just described, and for them to feel empowered to take on a range of roles that emphasize the active production of information. At the point when metaliteracy was developed, information literacy emphasized the cognitive and behavioral aspects of engaging with information [8, p. 24]. Metaliteracy added two additional domains--the metacognitive, as previously mentioned, and the affective. For learners to first envisage themselves, and then actually engage in, roles that might initially seem beyond their comfort zones, they need to reflect on their abilities and their need for new knowledge or competencies in order to succeed. They also need to recognize and confront how they feel about undertaking unfamiliar roles that might involve the production or sharing of information,

created either collaboratively or individually. Metaliterate learners welcome such challenges, but it is only through engaging all four domains that their open characteristic can be fully realized.

2.3 Metaliterate Learner Roles

As described in the previous section, metaliteracy provides a comprehensive view of the individual by encompassing four domains of learning that separately and in tandem inform multiple learner roles (Figure 2). While individuals may play these parts to varying degrees, the awareness gained through the application of the four domains, and related metaliteracy learning activities, enhance or develop these empowered responsibilities. For instance, metaliterate learners are active **participants** in social communities, contributing ideas and insights as part of a dialogue with others in a purposeful way. This role is enhanced by the **communicator** who emphasizes the clarity of messages sent in multiple forms and understands the impact of technology on effective communications. The metaliterate learner is a **translator** of information who interprets ideas from one mode or platform to another while adapting content from one medium to another or from one artistic or literary form to another. As **authors**, metaliterate learners are capable of writing and telling stories in multiple forms, from text, to audio, to multimedia, and combined in emerging virtual worlds.

Metaliteracy advances the idea that learners are also **teachers** and this role is evident in both formal and informal settings when individuals construct and share knowledge together. Metaliterate learners are developed as **collaborators** in social settings, prepared to define and achieve shared goals that benefit a larger community or collective. As **publishers** of information in multiple forms, metaliterate learners understand the responsibilities associated with curating relevant and reliable information and initiating editorial mechanisms that are defined and supported by a community of peers. As a unified model, these interrelated roles reinforce the metaliterate learner as a **researcher** capable of challenging assumptions while defining and developing a reasoned argument based on evidence.

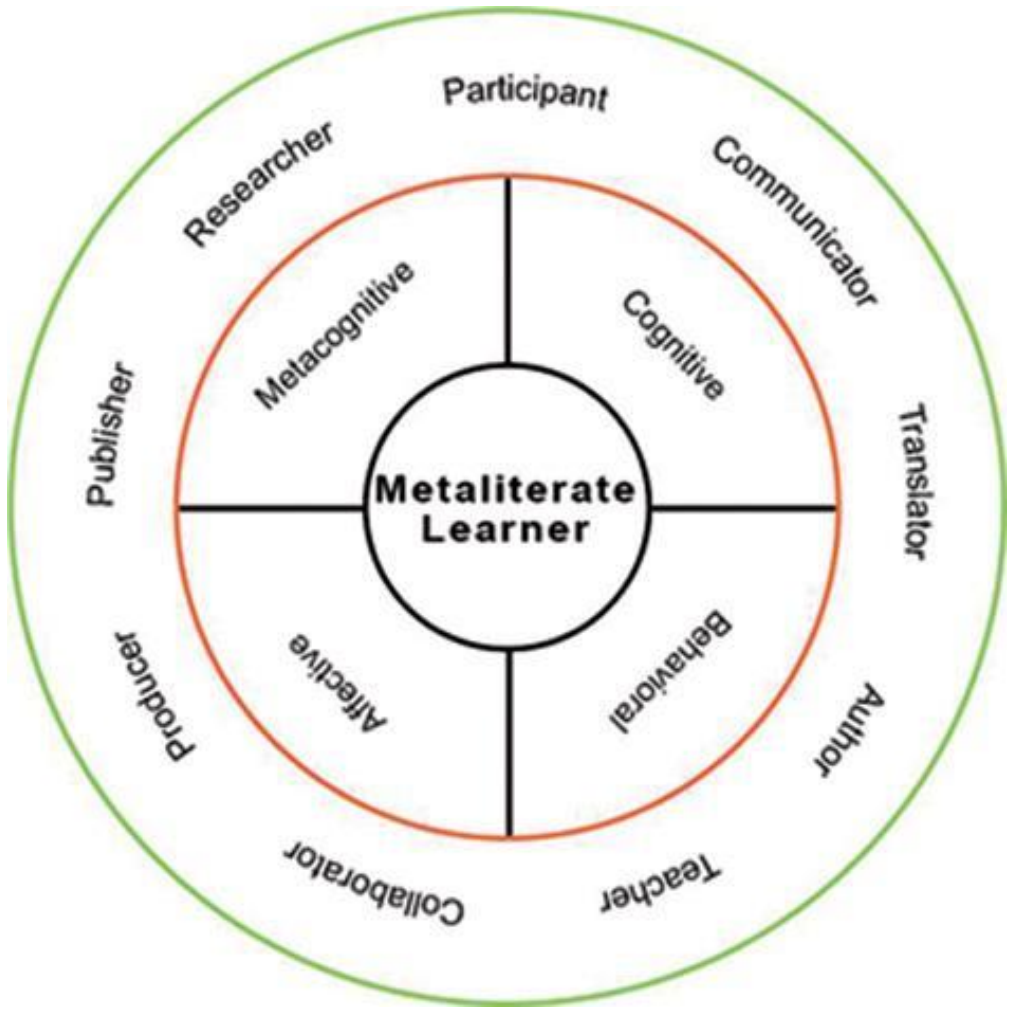

Fig. 2. The Metaliterate Learner (https://metaliteracy.org/ml-in-practice/metaliterate-learner-roles/)

2.4 Metaliteracy Goals and Learning Objectives

As individuals work toward attaining metaliterate learning characteristics and enact a range of empowering learner roles, the metaliteracy goals and learning objectives [9], informed by the learning domains, are pivotal to this ongoing pedagogical process. The metaliteracy goals and learning objectives were revised in 2018 in response to the challenges of the post-truth world. For instance, the first goal: "Actively evaluate content while also evaluating one's own biases" addresses the concerns about confirmation bias, or seeking out information that simply supports one's own preconceptions. This goal is supported by several specific learning objectives that require learners to acknowledge expertise and check for legitimacy in content and sources, while differentiating between opinion and fact in user-generated information.

The second goal, "Engage with all intellectual property ethically and responsibly" addresses concerns about false and misleading information and the responsibility of individuals to ethically produce and share content. This goal is reinforced by several

learning objectives that emphasize the need to differentiate between original and repurposed content, to ethically remix and reuse openly licensed materials, and to always properly attribute intellectual property based on peer expectations.

The third goal reflects one of the key tenets of metaliteracy to "Produce and share information in collaborative and participatory environments." Associated learning objectives ask the learner to envision themselves as producers of information. In doing so, they must be ethical and conscientious participants who share knowledge accurately and responsibly, while recognizing diverse cultures to effectively communicate information with global audiences.

The fourth metaliteracy goal empowers learners to "Develop learning strategies to meet lifelong personal and professional goals." This is supported by several learning objectives that emphasize learning as a lifelong process and learning from errors or mistakes. The objectives encourage learners to assess their own gaps in knowledge, while being persistent and adaptable. Ultimately, this goal prepares individuals for being open to new learning, adapting to changing learning technologies, and applying metaliteracy through continued practice.

As interest in metaliteracy has expanded to a global audience, the next step in the development of the Metaliteracy Goals and Objectives is to translate this foundational work into different languages. The first translation of the Metaliteracy goals and learning objectives in French, Buts et Objectifs d'apprentissage, was developed by Florent Michelot, a Ph.D. candidate in andragogy at the Université de Montréal, based on a self-efficacy scale he designed that applies metaliteracy principles.

Openness is infused in the metaliteracy model and serves as a goal for praxis to provide teachers and learners with resources to apply the concepts. This approach reinforces the collaborative nature of metaliteracy as a learning theory, with associated goals and objectives, while influencing the design of jointly created and openly available learning objects and learning environments. The metaliteracy framework supports the goals of UNESCO's Paris OER Declaration 2012 [21] to make content openly available as a human right and to do so through technologies and the development of collaborative learning environments. Metaliteracy and UNESCO's concept of Media and Information Literacy (MIL) are similarly focused on the empowerment of people through the development of core information competencies, while metaliteracy emphasizes metacognitive reflection and learner as producer, as a central parts of the model. The International support for Open Educational Resources (OERs) has influenced metaliterate teaching and learning, as demonstrated in multiple metaliteracy projects designed by the Metaliteracy Learning Collaborative in open formats.

3 Opportunities for Open Pedagogy Using Open Educational Practices

The development of the OER movement over the past twenty years has created conditions for a transformational change in teaching and learning. New models and frameworks provide the basis for innovative, learner-centered pedagogical practices which align with the principles of open education and the values of community formation that are necessary to promote dialogue in an era of increasing polarization.

The open content movement has moved beyond the simple incorporation of open educational resources. The affordances offered by these adaptable sources provide a path to educational practices that shift modes of learning in significant ways. OER have provided the impetus for both open educational practices (OEP) and open pedagogy.

Cronin's definition of open educational practices extends to open digital spaces and openness between personal and professional boundaries: "Collaborative practices that include the creation, use, and reuse of OER, as well as pedagogical practices employing participatory technologies and social networks for interaction, peer-learning, knowledge creation, and empowerment of learners" [4, p. 3].

DeRosa and Robison [6, p. 116] emphasize that "OER…empower faculty and students to work together to customize learning materials to suit specific courses and objectives. It's the way that the learning materials respond to learners and teachers that makes OER exciting…" Open pedagogy, which builds upon OER and OEP, envisages learners as active participants in knowledge creation. Courses become "platforms for learning, collaboration, and engagement with the world outside the classroom" [6, p. 117]. Smyth, Bossu, and Stagg advocate for an "open empowered learning model of pedagogy" that supports learners interacting not just with content, but also with other learners and with technology [19, p. 2201]. They envisage that learners will undertake the role of teachers, scaffolded by the potential of OER and OEP [19, pp. 2201-2].

Cronin refers to the work of Lane, "who suggests that open education initiatives can be considered in two broad forms [13]. The first seeks to transform or empower individuals and groups within existing structures…. A second form of open education seeks to transform the structures themselves, and the relationships between the main actors (learners, teachers, and educational institutions), in order to achieve equity" [5, pp.10–11]. Existing structures include educational situations, whether in person or online, that involve traditional relationships between teachers and learners. This type of learning frequently leads to formal degrees or certifications. The second form of open education leads to new learning opportunities, ones where the learner may play a pivotal role in determining a personal learning pathway. A possible outcome of such learning might be micro-credentials that attest to specific new knowledge and competencies attained by the learner.

In just this brief scan of the literature, the conception of learners as active participants, collaborators, and teachers is clearly inherent in open pedagogy. So too are they vital components of metaliteracy. Technology plays a role in OEP and open pedagogy, enabling the sharing of content and practices, and providing one way for learners to collaborate. Technology is also a core foundation of the metaliteracy framework, a mechanism for offering and using open content, and a means for engaging with and between learners.

The Metaliteracy Learning Collaborative, driven by a sense of inquiry informed by multifaceted situated experiences, develops open resources that allow not only for incorporation into existing structures such as formal courses, but also for use by lifelong learners as they chart and follow their self-directed learning pathways, which mesh with Lane's two broad forms of open education initiatives [13].

In the following section, we highlight several examples that showcase uses of these open resources, and the potential they provide for enabling learners to become reflective consumers and creators in today's complex information environment.

3.1 Think Globally, Act Locally

The open metaliteracy resources have been developed for the broadest possible use, not only geographically, but also for use by learners at different life stages and with different interests and focuses. They are pertinent for secondary and post-secondary education, as well as for formal and informal continuing education for learners in any field or career. Grappling with information and our roles as information users and producers is a universal concern, one that has acquired increasing urgency in recent years.

This emphasis on broad applicability is particularly obvious in the development of the four metaliteracy massive open online courses (MOOCs), which were designed to be open to all learners, regardless of their location. Lamentably, access to technology and language barriers are limiters; however, our experience has been that learners ranging from high school students to professionals to retirees throughout the world have taken advantage of these open resources.

In addition to the four MOOCs, The metaliteracy goals and learning objectives also inspired the development of the comprehensive Metaliteracy Badging System, a scaffolded suite of learning activities (Figure 3), which to date has primarily been used in formal educational settings. The learning system, which allows students to work their way toward four shareable digital badges, is designed to be flexible, so instructors may assign and integrate various components according to their particular instructional needs. The broad application of this instructional tool across a variety of disciplines at The University at Albany [18] and in MOOCs designed with Empire State College [17], in conjunction with more recently developed metaliteracy OERs, demonstrates the potential impact of these resources, as well as the adaptability inherent in OERs.

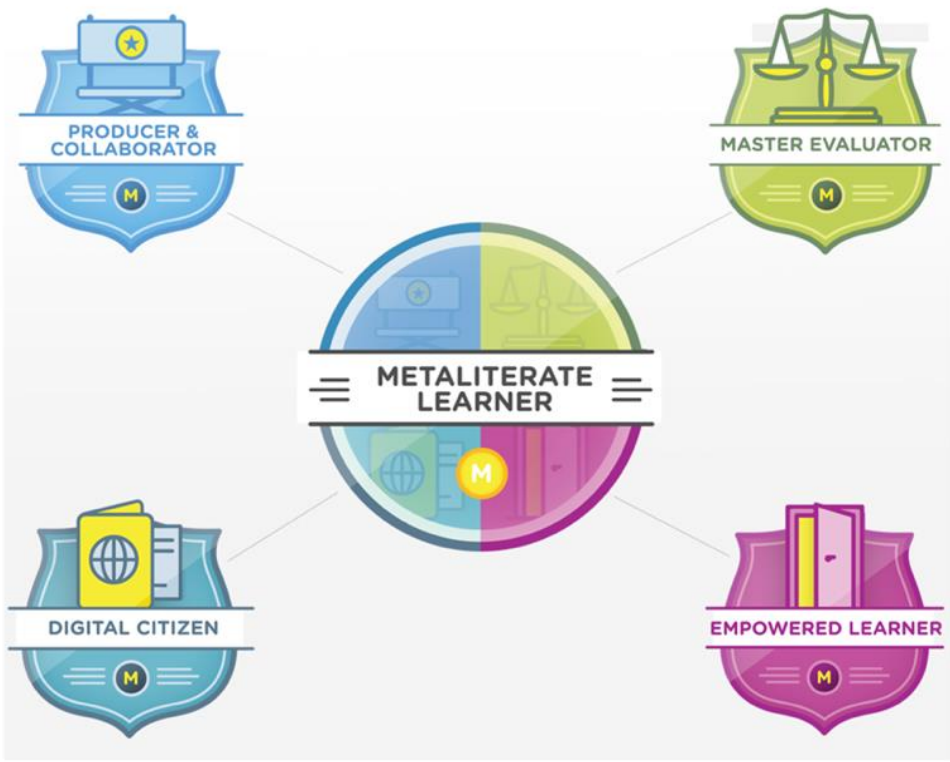

Fig. 3. The Metaliteracy Badges (https://metaliteracy.org/ml-in-practice/metaliteracy-badging/)

A fundamental characteristic of OERs is that they are available to be freely used and adapted by others. As the metaliteracy OERs undergo various implementations and modifications the metaliteracy framework itself is also evolving in response to these diverse use cases. It is particularly exciting that implementations have spurred the refinement of existing resources and the development of new core tools that are now available for use in new settings. Four local adaptations of the resources described above demonstrate the potential customizations and expansion of these learning tools by a range of educators.

Post-Truth MOOC and Wrap-around Course. After developing one connectivist MOOC and two xMOOCs, the Metaliteracy Learning Collaborative applied metaliteracy to the design of an Open edX MOOC to address the challenges of a post-truth society. This grant-funded project is supported by the Innovative Instruction Technology Grant (IITG) program at the State University of New York (SUNY) and is informed by Mackey and Jacobson's book *Metaliterate Learning for the Post-Truth World* [15]. Prior to the Open edX project, O'Brien, Forte, Mackey & Jacobson argued that metaliteracy is "a conceptual framework to address the challenges of learner-centered MOOC design" and analyzed the application of metaliteracy concepts in three different MOOCs "to enhance the engaged and participatory components of metaliterate learning" [17]. The authors found that metaliteracy is effective in supporting metacognition and self-regulation in learner-centered MOOC environments and that an approach to MOOC design that combines features of cMOOCs and xMOOCs would be especially beneficial to the learning experience [17]. This insight led to the selection of Open edX for the post-truth MOOC in an effort to explore platform features that allow for more

freedom in the design of collaborative learning environments, and in the learning experience itself. As part of this project, a for-credit, fully-online version of the course has been designed and delivered at SUNY Empire State College to prepare learners for the MOOC. This wrap-around course links to the MOOC after several foundation modules, providing additional opportunities for metacognitive reflection and building a cohort that completes the open learning experience together.

Integrating Metaliteracy into a Discipline. A political science professor at the University at Albany, a frequent and enthusiastic user of the Metaliteracy Badging System, teaches a course incorporating the general education competencies of information literacy, critical thinking, and advanced writing. This professor was originally drawn to the components of the system that met course needs connected to information literacy and critical thinking, not only because of the content, but also through the open-ended activities that also promoted self-reflection. However, the instructor did not stop at assigning existing content; she also asked her students to create their own learning content that took the same form as those they were working through. They presented their learning units to the rest of the class, allowing an opportunity for peer review. Her goal was for learners to understand their roles as information producers and teachers, key elements of the metaliteracy framework. To signal the nature and value of this work, a Broaden Horizons badge was developed and awarded to those who successfully completed the semester-long, metaliteracy-infused course components.

This professor's deep engagement with this metaliteracy OER recently led to the development of a new resource. She mentioned that students did not fully understand or relate to the metaliterate learner roles, and asked whether it would be possible to provide more information about the roles. Using a constructivist model, we developed a series of questions that help to illuminate and promote exploration about each role. The professor has been exploring potential applications in her course. While this is an evolving process, her immediate response to an email message that these had been completed shows her enthusiasm: "So maybe a couple times in the semester I could explicitly have an exercise in class that in this case asks people to be translators, teachers etc. That could be fun." The expanded scaffolding for the learner roles has extended to an enhanced graphic that will be used in a range of our OERs, and will be available for others to use and adapt.

Customization of Existing Content in K-12 Settings. An instructor in the University at Albany's School of Education identified one of the four Metaliteracy badges, Digital Citizen, as a valuable resource that would help prepare her graduate students to teach these concepts in their own K-12 classrooms. This initial application expanded to a broader project through the support of an IITG, for which the Metaliteracy Learning Collaborative joined forces with graduate education programs at two different SUNY institutions to develop content that would support graduate students' metaliteracy competencies, specifically digital citizenship [2]. The School of Education instructor, who served as Principal Investigator for the grant, recognized that these competencies were

critical to her students' success, both in the graduate program and in their future roles as educators. The project supported student inquiry by facilitating metacognitive thinking, empowering learners to take ownership of their learning, and strengthening their metaliterate mindset and digital citizenship skills. Similar to the first use case described above, a custom badge, Digital Citizenship for Educators, was developed for the graduate students who completed the required components. These included the existing activities required for the Digital Citizen badge, along with custom activities designed by the instructor that focused on digital media practices for the K-6 classroom.

This collaboration between University librarians and graduate education instructors culminated in a series of workshop presentations at a conference for local educators, and also led to the creation of Educators' Corner, an open suite of resources for teaching digital citizenship. Our collaborations on this grant provided valuable input as we attempted to create a model process for customizing applications of the system for various learning contexts. Ultimately our work on this grant sparked the idea of learning pathways as a solution that would facilitate customization of the metaliteracy badging content across disciplines and institutions.

Self-Directed Learner Challenge. The idea of the self-directed learner is an educational pillar that is central to lifelong learning and supported across multiple disciplines. By incorporating this idea into metaliteracy and building open resources around it, we have been able to share our interpretation of this foundational concept with educators and learners alike. In one example, we developed content for our badging system that specifically defined and described self-direction as part of a series of activities about Metacognitive Reflection (https://sites.google.com/view/metaliteracy/empowered-learner/metacognitive-reflection). Learners complete the Self-Direction challenge, along with the associated Critical Thinker and Learner as Teacher quests, to earn the Empowered Learner badge (https://sites.google.com/view/metaliteracy/empowered-learner). The Self-Direction challenge (https://sites.google.com/view/metaliteracy/empowered-learner/metacognitive-reflection/self-direction) features a narrative that encourages learners to reflect on the times in their life when they pursued learning on their own, both formally and informally. It quotes from one of the key figures in adult education, Malcolm S. Knowles who wrote:

> Self-directed learning is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. [12, p. 18]

This challenge culminates in a metacognitive writing assignment that asks learners to think through and respond to questions related to both individual reflection and peer reflection. Writing about and evaluating their experience with self-direction places learners in charge, with a focus on developing strategies for success and evaluating their own learning in conversation with peers.

At SUNY Empire State College, undergraduate students design their own concentrations by working collaboratively with a faculty mentor as part of a for-credit course, Educational Planning, which emphasizes self-direction. In an inventive reuse of the open content from the digital badging system, Dr. Susan Oaks, who oversees the online versions of Educational Planning course at SUNY Empire State College, repurposed the Self-Direction challenge as part of a major revision of the templates for Educational Planning. Dr. Oaks developed an entirely open resource for the course that serves as an open textbook in which the challenge is part of a chapter on Learning Engagement (https://courses.lumenlearning.com/suny-esc-educationalplanning/). This work is supported by a SUNY-wide initiative, OER Services, to expand the use of OERs throughout the system. As an open resource, this repurposed learning activity advances self-direction as part of Educational Planning while demonstrating how key this concept is to metaliterate learning as ongoing praxis in many different settings.

4 Challenges and Opportunities

The varied and broadening applications of the open metaliteracy resources have presented technical and logistical challenges, but they have also created opportunities to evolve these learning tools and expand the reach of metaliteracy to a global audience.

The Metaliteracy Badging System was originally conceptualized in 2012 as part of an IITG project that also established the Metaliteracy Learning Collaborative. At the same time, the open badging movement was beginning to take hold in the education landscape. From the outset it was clear that the principles of open badges were well-aligned with the goals of the metaliteracy framework as proponents of lifelong, self-directed learning that occurs both within and outside of the traditional classroom. Metaliteracy, likewise, empowers students to take ownership of their learning as a lifelong process through self-reflection and metacognitive thinking. Badging presented an opportunity to explore a more broadly scaled implementation and assessment of the learning goals established by the metaliteracy framework.

Originally developed on Wordpress, the Metaliteracy Badging System has since seen iterations on Canvas Network, Google Sites, Candela, and a homegrown platform that is expected to be launched in fall 2019. Over the course of its development the system has evolved both in content and in its reach across several learning contexts. From the beginning, our goal for this open learning tool was that it would be freely available for any learner or educator to access and adapt the content for their own needs. We intentionally developed this resource outside of a learning management system in order to ensure broader accessibility. However, as use of the system expands it becomes more challenging to ensure that it accommodates various teaching and learning scenarios.

The main challenges with creating open resources for metaliteracy have stemmed from issues with the learning platforms. We want our open resources to be free, accessible, flexible and customizable. However, many of the platforms we have tried for

both the Metaliteracy MOOCs and the Metaliteracy Badging System restrict these open qualities in some way, sometimes due to technical issues, and other times due to the inherent design of the platform. These challenges have led to many iterations of our various metaliteracy projects, but they have also created opportunities for us to continually improve and refine these resources.

In the case of the badging system, we have been challenged to create mechanisms that facilitate remixing and customization of the content for various learning situations. Many instructors have expressed a desire to make tweaks to the content and assignments in order to align the activities with their curriculum, which we welcome for our openly licensed content; however, facilitating these adaptations within the existing platforms is complex, and has required us to develop our own badging system from scratch.

After several years of refining the badging system, we have identified a potential solution in the form of customized learning pathways that would allow the existing metaliteracy content to be remixed and augmented for specific learning contexts. In addition to making the content more adaptable, we envision this functionality, which we have started designing for the new version of the system, as a potential facilitator for inter-departmental and cross-campus collaborations. The pathways would bring together learning experiences from various disciplines and campus sectors that work towards common objectives and goals. These collaborations could potentially expand to K-12 schools, community organizations and employers. Furthermore, learning pathways can serve as valuable visuals for promoting metaliteracy learning, allowing educators to see how their colleagues are teaching with badges and for students to see potential pathways taken by their peers that they might also be interested in pursuing. Lucas Blair, co-founder of Little Bird Games, who has served as a consultant for this project, sees learning pathways or "skill trees" as a motivating visualization tool for students throughout the learning experience, helping them to understand learning objectives, visualize goals, and reflect on their progress [3, pp. 64-65].

As with the badging system, we have implemented the metaliteracy MOOCs on various platforms, including a homegrown connectivist MOOC (cMOOC), Coursera, and Canvas. The first metaliteracy cMOOC aimed to capture the spirit of the original connectivist MOOCs by decentralizing instruction and encouraging participants to generate content and make their own connections and interpretations. However, students were largely uncomfortable with this unconventional format, and it became clear that they required better instructional support in order to take on these more active roles in the course. The more familiar structure of the xMOOC platforms, Coursera and Canvas, helped guide students with built-in functionalities such as the peer assessment tool that helped facilitate the learner's role as teacher. However, the rigidity of these platforms was also restrictive and perpetuated a lecture-centered model that counteracted our open pedagogical goals. Our latest MOOC, on metaliteracy in a post-truth world, offers a hybrid model that opens up the course to student discourse and contributions, while also providing scaffolding to support the development of active metaliterate learners.

5 Conclusion

As a global society, we are faced with enormous pressure to develop methods to address information-based challenges that affect our daily lives. Many of these challenges stem from the connectedness enabled by the web and social media. Technological solutions are being developed that will help to counter the dissemination of inaccurate information, but ultimately, people--citizens--need to learn how to engage successfully and productively in this post-truth milieu. Metaliteracy offers a pedagogical model to promote an approach that goes beyond technological solutions, with open learning resources that may be adapted to a wide range of learning environments, from formal to self-directed. The four applications documented in this paper provide just a small selection of ways to incorporate metaliteracy into effective teaching and learning practices. The goals and learning objectives, metaliterate characteristics and learner roles, and the associated learning objects are applicable regardless of discipline, and will continue to be adapted and adopted to fit specific needs. However, while the content is open and accessible, the technology that would enable the full integration of metaliteracy learning principles with content accessibility is lagging behind. Some functionalities, such as learning pathways, and some platforms may offer solutions that will help to mesh the two. As technologies that enhance connectedness are developed, their application to metaliteracy will be explored and refined to advance metaliterate learning.

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The InfoLit Project (2015-18): A collaboration among eight university libraries in Hong Kong

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Abstract. The InfoLit Project (2015-2018) is an eight-university collaboration project funded by the University Grant Committee Hong Kong to promote awareness and facilitate teaching and learning of information literacy (IL) for analytical, creative, and wise use of information. Vital blocks of this project complement each other and form an "identify, design, collaborate & embed" project scope that addresses not only the production but also the integration of learning objects created by this project to address and fit into a wide range of teaching and learning goals and contexts. These blocks are, first, investigate and build a knowledge base of students' IL educational needs through qualitative and quantitative research; second, design and assemble InfoLit for U MOOC and related courseware packages derived from it which are embeddable into university teaching and learning activities; and third, enhancing librarian-faculty collaboration on designing and embedding relevant IL course components into courses.

Keywords: Information Literacy, MOOC, Informed Learning.

1 Introduction

Information literacy education is a catalyst to transform the information society of today into the learning society of tomorrow (Bruce, 2008). It is also pivotal to academic achievement and lifelong employability of students. While it is an international trend to integrate information literacy education into the university curriculum, it is not a standard practice in Hong Kong yet. Under this context, undergraduates' understanding of information literacy varies a lot, leading to potential inefficiencies in teaching, learning, or research. For example, many students default 'research' (an intellectual activity) with 'search' (in an operational sense), unable to pinpoint views and arguments most relevant to their work from the sea of information, or lack critical competence and mindset to pursue more compelling research works.

2 Developing a Knowledge Base of Students' Information Literacy

Two studies, namely 1) IL educational needs study and 2) RRSA-HK survey study were conducted to investigate and understand the information literacy educational needs of undergraduates in Hong Kong. Findings of the two studies were studied in-depth by project staff and librarians to justify the curriculum design of InfoLit for U MOOC.

The students' information literacy (IL) education needs study (IL Needs Study) is a cross-sectional case-study designed to investigate IL-related beliefs and behavior of Hong Kong undergraduates studying different domains. Each of the eight participating university designs a discipline-specific information task (Table 1) and recruits twelve undergraduates to participate in this study. All 96 two-hours sessions were completed in early December 2015.

Table 1. Subject domain and goal of IL task taken up by participating universities

Discipline	Designer	Role of Student	Goal of information task
Arts & Humanities	Lingnan University	Staff of a local textbook publisher	To prepare a proposal for education resources pack to illustrate the aspects of the Japanese Occupation of Hong Kong and propose relevant resources.
Business & Economics	The Hong Kong Polytechnic University	Marketing director	To write an analytical report to identify the country that has the most significant market potential and develop a marketing strategy to generate the most profit.
Education	The Education University of Hong Kong	School teacher	To design a lesson plan for General Education module to address the cyberbullying.
Engineering	Hong Kong University of Science and Technology	Engineer of a consulting firm	To write a proposal for the HKSAR government to provide an innovative engineering solution to reduce air pollution emissions and carbon intensity in Hong Kong.

Health Sciences	The University of Hong Kong	Health care worker	To write an article for a magazine to illustrate the possible sources of lead poisoning and the effect of elevated blood lead levels on child development.
Law	City University of Hong Kong	Trainee solicitor	To write a report listing the options which are open to the parties to resolve the dispute.
Science	Hong Kong Baptist University	Advisor to the Commissioner of Hong Kong's Innovation and Technology Commission	To write an analytical report to identify: a) The potential benefits and risks of nanotechnology and b) Potential innovations in nanotechnology that will be particularly beneficial to Hong Kong society.
Social Sciences	The Chinese University of Hong Kong	Consultant of a think tank in Hong Kong	To prepare an analytical report to explain the property market and wealth gap situation in the past decade and suggest two factors that can help to improve the situation in Hong Kong.

RRSA-HK survey study (Research Readiness Self-Assessment (RRSA-HK) is a standardized fixed-choice information literacy survey adopted and localized from the original Research Readiness Self-Assessment (RRSA) instrument (Ivanitskaya, 2004). Among the six aspects of IL measured, three belong to IL knowledge (obtaining information, evaluating information, understanding plagiarism) while three belong to IL-related beliefs (browsing the Internet, library and research experience, and perceived research skill). RRSA-HK was administered to 3,200 local undergraduates in two rounds of data collection in two rounds of data collection (first round in September 2016, second round from March to June 2018). Stratified sampling was conducted to ensure the sample reflects the proportion of the population of students studying different key learning areas.

2.1 Students' IL At-Work and Self-Understanding

The findings of the IL needs study strongly suggest that students' IL-related beliefs guide their information search behavior. First, the findings draw an interesting overview of students' IL knowledge and self-belief according to their 1) self-rating participants gave themselves on their performance at the IL needs task, and 2) actual score

they obtained from the IL needs task. By doing so, participant's performance data could be grouped into four types for conceptualization and ease of discussion (Table 2). To explain, both type A and type C students believe their performance at the IL needs task was good, however, only type C students' performance obtained a high score according to a rubric developed from the AAC&U's information literacy value rubric. In contrast, both type B and type D students gave low self-ratings on their performance. However, only type B students' performance was not desirable in the study.

Table 2. Types of student categories conceptualized from the IL educational needs study

Type A students (over-estimated themselves) High self-rating (*7-10*) on performance, but the quality of output of the IL needs task is in fact not good according to the rubrics (*e.g. 0-5 total score, incomplete draft or copy-&-pasted from the task outline provided).*	**Type C students (honest reflection)** High (*7-10*) self-rating on performance, and quality of output of Q1 of the IL needs task is good according to the rubrics *(e.g. 6-12 total score, with elaborated draft outline of report that show intentions and efforts in exploring related issues, working through the content, and/or synthesizing arguments).*
Type B students (honest reflection) Low (*1-3*) or medium (*4-6*) self-rating on performance, and quality of output of Q1 of the IL needs task is not good according to the rubrics *(e.g. 0-5 total score, incomplete draft or copy-&-pasted from the task outline provided).*	**Type D students (humble ones)** Low (*1-3*) or medium (*4-6*) self-rating on performance, but the quality of output of Q1 is in fact good according to the rubrics (*e.g. 6-12 total score, with elaborated draft outline of report that show intentions and efforts in exploring related issues, working through the content, and/or synthesizing arguments).*

In summary, such conceptualization and grouping of findings helped the project to reach the MOOC design insight that other than introducing operational or procedural information skills, a large part of effort should be devoted to addressing students' motivation to transform their IL-related beliefs and conceptions (e.g., type A students). While facilitation for type B students is rather straight forward, type C and D students should focus on helping these students to identify areas for further enrichment.

2.2 HK Students' Strengths and Weaknesses in IL

Findings from RRSA-HK, a large-scale survey study, provides in-depth insights into the strengths and weaknesses of IL among our students, thus guides the design of the InfoLit for U MOOC. Table 3 presents the mean overall and aspect scores of the two rounds of RRSA-HK survey. All mean scores from the 2018 dataset are higher than the

2016 dataset. Among the three aspects of IL surveyed, students in both sets of data had performed less successfully in evaluating information.

Table 3. The mean overall and aspect scores of the RRSA-HK.

IL Competence	Max Score	Dataset	N	Score Range	Median	Mean Score	**Score***	S.D.
Overall Il (Sum Of All 3)	80	2016	1557	17-79	51	50.8	63.5	11.5
	80	2018	1445	22-79	55	53.5	66.9	11.9
Obtaining Information	30	2016	1557	9-30	20	20.1	67.0	3.9
	30	2018	1445	7-29	22	21.5	71.7	3.8
Evaluating Information	33	2016	1557	0-33	20	19.5	59.1	7.6
	33	2018	1445	0-33	20	20.2	61.2	7.7
Understanding Plagiarism	17	2016	1557	0-17	11	11.3	66.4	3.6
	17	2018	1445	1-17	12	11.7	68.8	3.7

* Mean score/Max score

Individual question items from the RRSA-HK provide insights into the kind of facilitation that Hong Kong students need (Table 4). For example, in evaluating information, Hong Kong students are relatively weak in summarizing the intention and critical messages from information they found. Also, they have problems in telling the credibility of information.

Table 4. Student's difficulties identified from RRSA-HK (selected).

Ability to obtain information

- Understanding the terminologies
- Identifying scholarly documents
- Differentiate primary and secondary information
- Generating complete citation

Ability to evaluate information

- Summarize key messages and purpose of information
- Tell the credibility of information

Understanding plagiarism

- Identifying cases of copyright violation
- The proper way of citation and direct copying
- Situations where citation are needed

3 The InfoLit for U MOOC

InfoLit for U MOOC is the main focus of the "build" part of this project, which is free and open to all learners around the world. The MOOC and related project were shortlisted for Hybrid Learning Awards by the Steering Committee of the Quacquarelli Symonds QS Reimagine Education 2018 Awards.

The design of modules of the IL courseware is based on the Association of College & Research Libraries (ACRL) Framework for Information Literacy for Higher Education (2015) to address students' IL-related weaknesses identified in the IL Educational Needs study and RRSA-HK survey study. Professor Christine Bruce's (2008) frames for informed learning, including personal relevance, competency, and learning to learn, guide the instructional design of each module.

In InfoLit for U MOOC, information literacy (IL) is not only defined as library skills and practices. Instead, a broader definition of IL is presented to learners as an interaction of three inter-related aspects, namely 1) IL related values & beliefs, 2) IL related skills & practices, and 3) Context of task problem.

The focal and the eight disciplinary modules of this MOOC are designed to help learners to become analytical, wise, and creative information user at university and professional challenges after graduation. The nine modules of this MOOC challenge common misconceptions reinforce IL competence transferrable between disciplines, through an engaging learning experience.

3.1 Focal Module

In the focal module "Not only search skills: What is InfoLit for U study & career?", learners learn how to use information for university-level inquiry works through five sections. Furthermore, learners learn the essentials of university-level inquiry in each of these modules through the five anchoring animations (Table 5) and interactive learning activities.

Table 5. Subsections of the focal module and title of its focal animation.

	Subsections of Focal Module	Focal Animation
1	Think & plan the "Info Needs" of your research	At University, Learning = Inquiry
2	Don't find answers: Search for ideas to develop ideas	The Amazing Journey of Information
3	Not just filter: Evaluate ideas to form new ideas	The Information Checkpoint

4	Never list them: Connect ideas to create your own idea	The New Ideas Constructors
5	Stay hungry: Join & learn from communities	Learning Never Ends

3.2 Discipline Modules

The eight discipline-related elective modules, each designed by our participating university respectively, dive deeper into the journey and help learners find, evaluate, and create high-quality outputs for tasks.

In each of the discipline modules, learners will face a task scenario typical to the discipline (Table 6). Sub-sections of these modules were designed to guide learners to go through different stages of research (e.g., develop a framework, find, evaluate, create). Discipline-specific IL and research tips were introduced through different kinds of learning objects (e.g., animated clips, infographics, library guides, questions, and so on) to learners. By the end of each module, learners will do an assessment task to check their understanding, followed by formative feedbacks for further developments.

Table 6. Information scenario of each discipline module.

Discipline Module	Scenario	Designed by
Arts & Humanities	Design an exhibition on the impact of Hong Kong cinemas and local culture	Lingnan University (LU)
Business & Economics	Prepare a business proposal	The Hong Kong Polytechnic University (PolyU)
Education	Lesson plan design scenario	The Education University of Hong Kong (EdUHK)
Engineering	An engineering innovation assignment	The Hong Kong University of Science and Technology (HKUST)
Health Sciences	Works related to a legal assignment	The University of Hong Kong (HKU)
Law	A community health project	City University of Hong Kong (CityU)
Science	Updating general chemistry laboratory manual	Hong Kong Baptist University (HKBU)
Social Sciences	Prepare a special report on elderly issues & social protection system in Asian countries	The Chinese University of Hong Kong (CUHK)

3.3 Insights gained since official launch

InfoLit for U MOOC was officially launched in February 2018. It is hosted on KEEP (Knowledge & Education Exchange Platform), a Chinese University of Hong Kong operated Open edX platform. As at the end of December 2018, InfoLit for U MOOC has recorded more than 4,500 headcounts of users, of which more than 3,000 accessed through LTI (Learning Tools Interoperability) links embedded in learning management systems of participating institutions by course instructors into their course(s). The pages of the nine modules were accessed more than 23,000 times in 2018.

Through analyzing participatory statistics of InfoLit for U MOOC, we learned more about students' needs (for example video loading statistics, see Fig. 1). Videos in InfoLit for U MOOC were loaded more than 22,000 times in total, of which the top 50 videos loaded by learners have accounted for 75% of all video loadings. Among the top 50 videos loaded by learners, most of these talk about learning at university in general (32%), followed by videos created for disciplinary IL content (19%). The previously mentioned InfoLit for U focal animations and videos that talk about informed learners came third (16%) and forth (15%) of top video loadings. Future projects of MOOC or learning guide creation may use these as user needs and design reference.

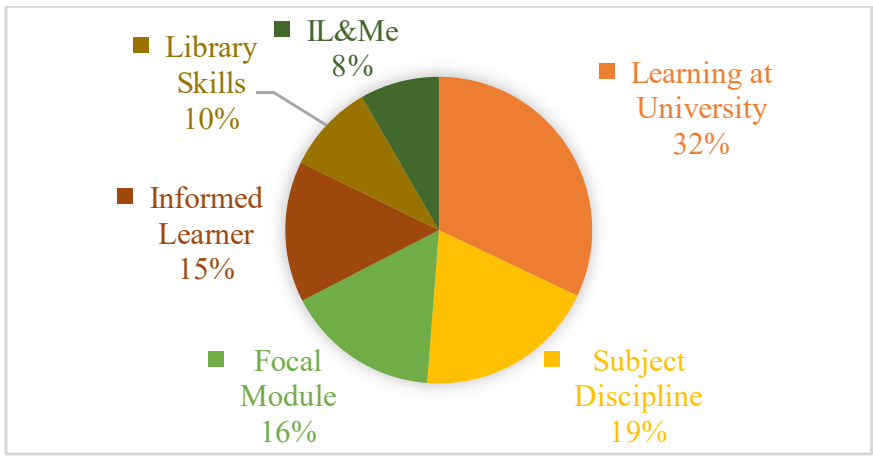

Fig. 1. Types of animations or videos loaded by learners in InfoLit for U in 2018

MOOC page loading statistics also inform students' learning behavior. Peaks of page loadings can be observed near the end of the semesters, i.e., May and June of 2nd semester of the 17-18 academic year, and November of 1st semester of the 18-19 academic year. Promotion or awareness raising campaign could use this insight to devise more effective plans as well.

4 Promoting & Enhancing Librarian-Faculty Collaboration

The "collaborate and embed" block of this project consists of two parts, namely the capacity building program, and the course enhancement funds.

The capacity building program (coordinated by the HKUST library) was conducted by Ms. Lisa Janicke Hinchliffe, Professor, and Coordinator for Information Literacy Services and Instruction, the University of Illinois at Urbana-Champaign, in 2016. The

goal of the series of workshops was to facilitate collaborative partnerships between librarians and faculty members. Designing learning activities and assignments that facilitate students to learn IL is another important goal. Forty professional librarians (five from each participating institution) learn not only from Ms. Hinchilffe but also from fellow librarians at other institutions who face similar yet different situations in facilitating the enhancement of information literacy. Key concepts covered include the community of practice; expert/novice mindset; organizational cultures in higher education; collaboration and partnership; informed learning; information literacy; logic models; instructional design; curricular structures; program planning and evaluation; assignments and assessments; rubrics; innovation adoption; and communication for advocacy.

Course enhancement fund is another critical piece of this project. Five small funds (approx. 1,500 euro) were available at each participating institution for faculty members and librarians to co-design and incorporate IL pedagogical components into the curriculum of different courses and programs. Bruce (1997) seven faces of information literacy framework was adopted to inspire and evaluate the designs of course enhancement projects (Table 7). In summary, the 40 course-enhancement projects funded have benefited more than 5,200 undergraduates in a broad spectrum of disciplines at the eight participating institutions.

Table 7. The seven aspects of information literacy enhancement outcomes in course enhancement fund projects

Aspect & Outcomes	Details	No. of projects addressed
1. Information Technology	My students developed awareness on latest developments in the course/subject/field of study using contemporary technologies.	21/40
2. Information sources	My students learned how to access different types of information sources on topics related to course/subject/field of study.	28/40
3. Information Process	My students explored and articulated their personally preferred information processes and approaches relevant to the course/subject/field of study.	19/40
4. Information Control	My students have created better learning outputs through controlled & managed use of course/subject/field of study related information.	21/40
5. Information Use (critical analysis)	My students have become more critical and selective towards using information to expand their knowledge base in previously unfamiliar area.	21/40

6. Information Use (Intuition)	My students have become more familiar in using information to construct new course/subject related knowledge, perspectives, and insights, etc.	21/40
7. Information Use (Value)	My students have developed awareness and capacity on using information to benefit others.	12/40

5 Conclusion: Enhanced Collaboration & Knowledge Transfer

Through the IL project (2015-18), the eight participating universities had achieved a deeper level of collaboration. Research design, research data from all eight participating institutions, MOOC content, animations, and videos, as well as designs and experience from course enhancements projects, are shared among the participating institutions.

It is also encouraging that even though the project has ended, each participating library devised plans to sustain the initiatives in ways that address the needs of teaching and learning in their specific contexts. Learning objects and pedagogical innovations of the InfoLit for U MOOC, and those from our 40 Course Enhancement Funds, will continue to facilitate student learning in future. The experience gained through this project will enhance and inspire further librarian- faculty collaborations as well.

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IL in secondary school

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Abstract.

It is not clear which is the proper age for a student to start learning knowledge and skill in the information literacy field. In our high school, with young learners from 11 to 18 years old, the target of our efforts is the second grade, with ages between 13 and 14.

The students are improving their information skill while learning another subject: spanish language and literature. Extra material has been added to the curriculum and the different learning tasks of the main subject are flavoured with requirements related to information literacy.

We have developed a competency rank to measure the competence of the students when dealing with information. This rank can be used to the first four years of high school and, more precisely, to the students of our second grade. They learn, firstly, to understand the library. After that, are introduced to the architectonical aspects of the Internet, including search engines, protocols and web structure. With that in mind, the main aspects of the bibliographical references are explained and they start working in the selection of sources. By the end of the year, students begin to check how some information are provided from different actors and its differences.

Keywords.

Young students, Information literacy, Media literacy, Secondary school, High school

Background.

We are a state secondary school located in Spain. We deal with young people from 11 to 18 years old. Most of our students are at secondary (compulsory) school (11 to 15) and some of them are at pre-university years (16-17).

Being aware that our schools are poorly developed in the IL field, we have made efforts and invested school funding to improve our library facilities. After several years, a complete school library was ready to be used *(IFLA, 2015)*. It has more than 4000 books, including reference materials, research articles and multimedia references. Due to limitations of space and budget, there are only eight personal computers connected to two servers. Although it might look unimpressive, few school libraries in state secondary schools with these traits in the region of Valencia exits.

Situation.

We realised our students showed a significant lack of knowledge of how to deal with it. The youngest ones were certainly unskilled, but surprisingly, those who were at higher levels showed similar results.

Thus, despite our organised and well-equipped school library, our young learners could not take full advantage of it: they were not able to identify their information needs properly, locate sources, find access to them or manage information.

Aim.

In a long-term, we want to improve the information literacy skills of all our students but particularly focusing on the 11-15 years old.

We have developed a guideline including what aspects every student should know about information literacy depending on their school year.

It includes:

- Common activities in each level. Coordinated by the school librarian.
- Common activities in each group. Coordinated by the tutor, that is a teacher that accompany a particular group as an advisor and controller through a school year
- Special activities in each subject or field. Coordinated by the teacher of each subject.
- Ellective practical activities for pre-university students. Coordinated by the school librarian.

First year, a first approach to an information literacy program was implemented in a selection of four groups of 12/13-year-old students. A fifth group of the same level and age which was not included in the program. This selection is based upon:

- The size of the group, with less than 25 students per class.
- The number of groups, five groups from which four will participate in the program.
- The impact of the possibly acquired skills on its future studies (that can be compared with data from previous years and with those obtained from the fifth group).

The methodology includes the development of information literacy skills based on the teaching of one particular subject: Spanish language and literature. This subject was chosen due to certain advantages:

- The teacher skills, who is also responsible for the school library and has information literacy training.
- Common aspects between the goals, contents and activities of the curricula of the subject and those of the program.

What we don't need.

As a state school we have some drawbacks to take into account, most of them related to the number of lessons per week and the curriculum of each subject, which are regulated by law. Furthermore, as it has been stated, information literacy is treated as a competence in the curriculum and is integrated in different subjects in a general way.

Due to the facts above, we don't need:

- A survey and/or questionnaire to check the students' information literacy skills.
- An activity which is not included in the subject syllabus/curriculum (Spanish language and literature, in this case).
- An investment in time that would prevent a normal development of the subject.

What we do need.

Spanish and language literacy is taught on a three hours per week basis. It includes: speaking, reading, listening, grammar and literature. With that in mind, we need:

- A description of the level of IL competence required for a student in their second year of secondary school.
- An accurate method for an integrated measurement of the information literacy skills of each student while learning an specific subject.
- A way to improve information literacy skills while teaching another subject as an interdisciplinary field.

Development.

A student finishing his or her first year in our school should basically know:

- How a library is organized. How to access to books and journals in the library.
- How to use a computer, digital storage, what the Internet is, how a search engine works.
- How to name the information sources they used.

In their second year, per term, students should achieve *(American Library Association,2000)*:

First term.
Correct use of the reference section: internal structure of documents, differences among them, .
Advanced knowledge of search engines: operators and basic inner algorithms. Make a short document explaining the differences in scope, functioning and utility.
Accurate definition of their information need through a conversation with the teacher.
How to make a basic reference of a written or digital information source.

Second term.
UDC, Dewey and other classifications: functioning and logic.
Basic evaluation of the subject information sources (1-5 scale).
Usage of a minimum of infomration sources.
Make a reference of an information source according to ISO standards.

Third term.
Research of Spanish language and literature articles in journal databases.
Preparation of a repository of information sources in Spanish language and literature.
Tips about storage/disposition of the retrieved information. Licenses.

The library training should be developed with "ad hoc" time but the rest of the goals will be achieved through monographic researches (generally, in three sessions of one hour), both individual and in groups, with an oral presentation. *(Baró, Mañà, 1994; Calderón, 2005,Peters, Matthews, 2007)*. This kind of work alllows to evaluate both the content and the procedure.

That is the key: the evaluation of both aspects from a IL point of view allows to define the knowledge of the student in that skill. For instance, some of the evaluated indicators are:

- The number of cited references, its correctness and the value granted by them.
- The draft with the retrieved ideas and information.
- The part of the oral presentation where they defend the method used.
- The oral meetings to share information in the groups during the research.
- The final document, as a structured document without paraphrasing.
- A final test inquiring about the knowledge of the topic researched.

Taking all this into account, a measurement system based on a rubric could be successfully implemented.

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Wither Law Student Information Literacy?

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Abstract: Information Literacy has only recently been applied to instructional frameworks and benchmarking assessment for legal research skills in the United States. This paper seeks to answer two simple questions: what has IL done for legal research since AALL has adopted Legal Research Competencies and Standards for Law Student Information Literacy, and what is the future of IL in legal research classrooms and the practice of law around the world?

Keywords: Legal Research Skills, Law Student Information Literacy, Legal Information Literacy.

1 What is Law Student Information Literacy?

1.1 The Road Recently Taken…

In 2011, my paper proposing standards for law student information literacy, entitled "The Road Not Yet Taken: How Law Student Information Literacy Standards Address Identified Issues in Legal Research Education & Training," was published in the preeminent scholarly journal covering law librarianship in North America. [1] Two years later, the American Association of Law Libraries adopted the Principles & Standards for Legal Research Competency (hereinafter, "Principles & Standards"), a document strongly informed by the draft standards I proposed in the article cited above. [2]

Law Student Information Literacy is summarized from top-level descriptors down, starting with overarching Principles that describe a given area of research abilities, which are analyzed into Standards that identify particular skills, resulting in Competencies that describe the behaviors of students who possess these skills.

The Principles are brief enough to be quoted here. They are, *seriatim*:

1. A successful legal researcher possesses foundational knowledge of the legal system and legal information sources;
2. A successful legal researcher gathers information through effective and efficient research strategies;
3. A successful legal researcher critically evaluates information;
4. A successful legal researcher applies information effectively to resolve a specific issue or need;
5. A successful legal researcher distinguishes between ethical and unethical uses of information, and understands the legal issues associated with the discovery, use, or application of information.

Attentive readers who notice similarities between the Principles & Standards and the first iteration of ACRL Standards for Information Literacy (ultimately replaced by the current ACRL Framework for Information Literacy for Higher Education) should know that these similarities are not unintentional. As one of the librarians consistently contributing to the working groups, task forces, and committees preparing the Principles & Standards, this author can attest to the fact that we were quite conscious of the ACRL's work, and found the reliance on competencies nested within standards underneath overarching principles to be a very useful model for the particular demands that legal research requires in the context of practice within a Common law jurisdiction.

Tuominen, Savolainen, and Talja famously posit that Information Literacy is a sociotechnical practice; they note that the "interplay between knowledge formation, workplace learning, and information technologies is crucial for the success of IL initiatives." [3] These factors are also crucial in the successful practice of law in the US: the American Bar Association has fully approved of the notion of "A Lawyer's Duty of Technological Competence." [4] And as of this writing, 34 of the 50 United States have adopted this duty into their local rules of practice. [5] The other factors, knowledge formation and workplace learning, are easily recognized in the practice of law as the formal legal training that a student undertakes to become a lawyer, and the licensing and requirements of continuing legal education that jurisdictions require for one to continue practicing as a lawyer.

Since the approval of the Principles & Standards, several publications and presentations have discussed and analyzed the standards as well as the overarching concept of legal information literacy; writing from a variety of jurisdictions, and focusing upon classroom research instruction. [6] AALL has also offered webinars training law librarians in the Principles & Standards, which reinforces the importance of such benchmarking to legal research education. [7]

1.2 Foundations of the Road that Lies Ahead…

The future of Law Student Information Literacy must be multinational. As legal practice continues to cross borders, knowledge of the foundations of legal systems, which provide context for understanding distinctions among legal systems, becomes more critical. [8] Law Student Information Literacy begins with knowledge of the foundations of the legal system in question, so the importance of an approach to legal research pedagogy grounded in Law Student Information Literacy is clear.

However, like legal systems themselves (and the comparisons of such systems), the future of Law Student Information Literacy is complex and nuanced. Legal systems of the world do not all share the same foundations, and are largely, if grossly, divided into two general systems: Civil law and Common law systems. Civil law is the dominant system in Europe, Asia, and Africa, and largely traces its roots to German iterations of Napoleon's efforts to codify and update the traditions of Roman Law to fit the needs of his empire. In any Civilian jurisdiction, the Code remains the source and foundation of law; and the Code comes from the legislature, parliament, or local body charged with writing the law.

Common law is the dominant system in the (former) British Commonwealth, including Canada, Australia, New Zealand, and the United States (which was never a proper member of the Commonwealth, but traces much of its legal and social traditions back to its founding as a British colony). While Common law jurisdictions tend to codify laws and regulations, and empower legislatures or parliaments to write those laws, they also reserve the right of reviewing such laws to the judiciary. The notion of judicial review, which has been the cornerstone of United States jurisprudence since *Marbury v. Madison*, 5 U.S. 137 (1803), has only begun to gather purchase among Civilian jurisdictions in the past generation or so. Assessing the value and longevity of this relatively recent development among Civil law jurisdictions remains a matter of individual scholarly judgment. [9]

To add nuance, many legal systems are also based in Custom or tradition, Religion, or, most commonly, some variation of these mixed with Civilian or Common law elements. When we look at the figure below, and consider the populations involved, it becomes immediately obvious that the majority of people on this planet are governed by a mixed type of legal system, usually involving some local evolution of a combination of Civilian jurisprudence, mixed with Customary or Religious law.

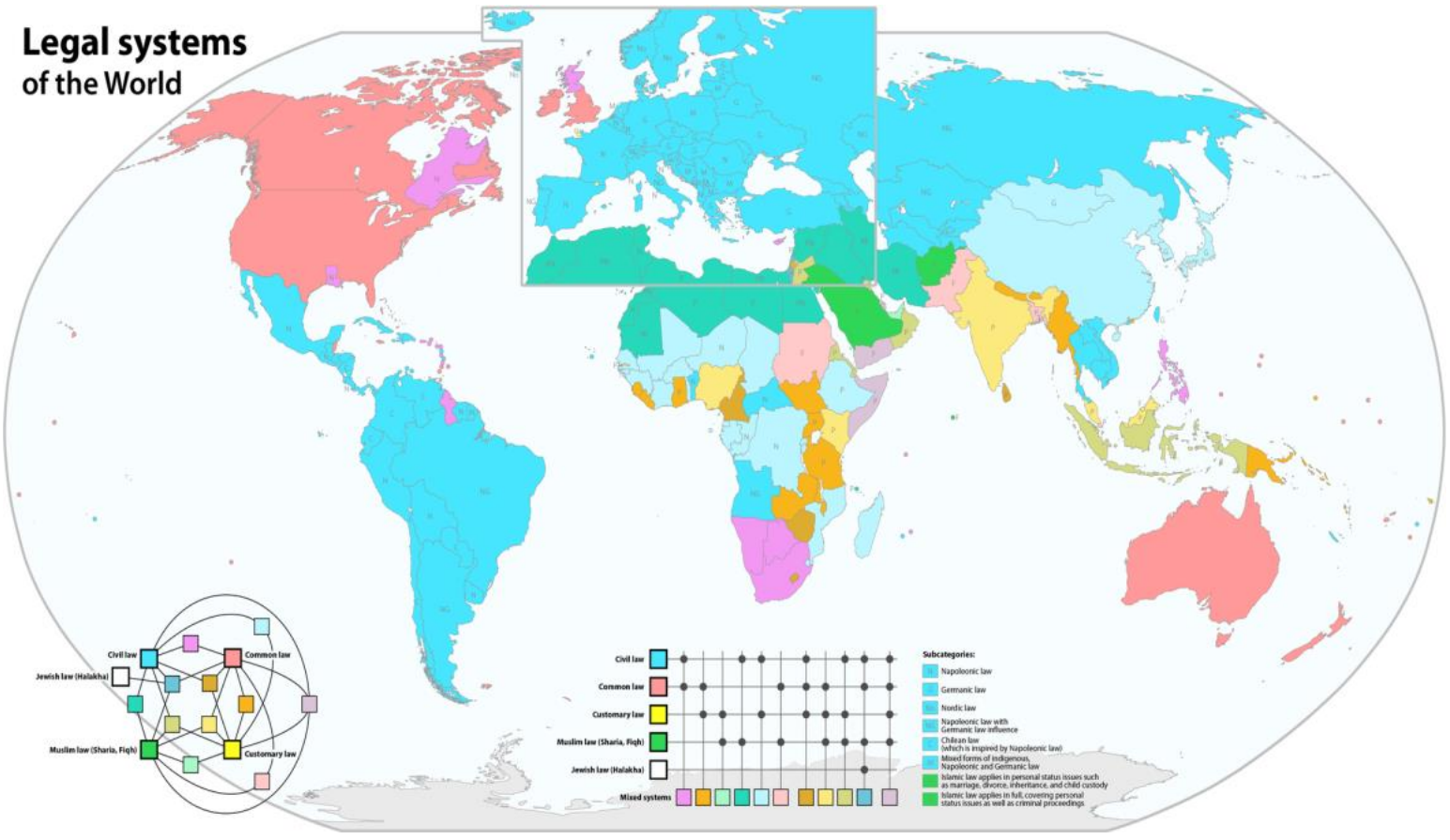

Figure 1: Legal systems of the world. The primary colors on the left side of the graph legend indicate, from top to bottom, Civil law, Common law, Customary law, Islamic law, and Jewish law. The blended colors running along the bottom of the graph legend indicate mixed legal systems. Note that the numerical majority of the world's population (consisting of the populations of China, India, Indonesia, as well a plurality of people on the continent of Africa) is governed by mixed legal systems, combining Custom, Civilian (or Common) Law, and/or Religion. [10]

Because legal research requires the practitioner to start searching for information among the types of documents that her legal system relies upon, legal researchers from differing jurisdictions will tend to start their research in different places. For example, an attorney who practices in France will likely start to look to the relevant local or national code for information and further guidance. An attorney who practices in the United States would not be incorrect in looking at published case law from state or local federal courts for guidance, or even to secondary sources that analyze this case law and other legal or regulatory developments in the area. And an attorney who practices in a Religious legal system would look to the foundational documents of that religion, as well as authoritative commentary on those documents, to find the information necessary to analyze the problem before her. All of these approaches are correct in the jurisdiction that a given practitioner works in, and baffling to attorneys who come from outside that jurisdiction.

And of course, because our subject is the practice of law, it is critical to remember that there are always exceptions: Louisiana, in the United States, provides such an exception; local state law there is based upon the French and Spanish Civilian Codes, while the overarching U.S. Federal system that governs Louisiana and other US states and territories is a Common law jurisdiction. [11] Scotland, in the United Kingdom, also retains some features of Civilian jurisprudence while remaining, like Louisiana in the United States, subject to a national jurisprudence that remains firmly based in Common law traditions. The Canadian province of Quebec is similarly positioned with respect to the larger Canadian federal legal system.

Moreover, as alluded to above, some Civilian jurisdictions have started to look to features of Common law to help resolve disputes, especially between states and their citizens. Mexico is one example, having in the past generation or so begun to look to decisions published by their federal Suprema Corte de Justicia de la Nación for limited guidance. [12] Even more surprisingly of late, some discussion at international conferences of legal scholars and librarians has expressed the notion of a "Common law of the European Union" comprised of the body of law that has emerged from the EU courts. [13] This a notion that would have been shocking 20 years ago, and unthinkable 40 years ago.

It is also critical to remember that legal training differs from jurisdiction to jurisdiction, just as legal tradition does. For example, United States bar associations have, with few exceptions, required that attorneys be trained in graduate-level schools of law for more than one hundred years. This degree is known as the Juris Doctor (JD), and generally requires an amount of classroom instruction comparable to a traditional Doctor of Philosophy degree (generally between 80 to 100 academic units of study), but completed within three to four years of commencing such study. The UK and Canada, however, allow attorneys to practice after taking an undergraduate degree in law, subsequent licensure and a bit of apprenticeship clerking (commonly called "articling" in Canada). These two Common law jurisdictions follow the norm of Civil law jurisdictions, where the practice of law requires licensure after an undergraduate or bachelor's degree. Attorneys may pursue further graduate degrees in law (usually a Master's of Law, commonly abbreviated as LLM), which may train the student in subject-area spe-

cializations (taxation is a common example), or may, in the case of foreign-trained attorneys coming to the US, provide a comprehensive understanding of United States law and practice. For obvious reasons, this latter option is never available to US-trained attorneys who have already earned the JD, but the LLM in taxation or other subject-area specialties are awarded to those US-trained attorneys who complete that course of study.

And once more, as observed above, since we are dealing with legal practice, we must always be sure to remind ourselves that exceptions to the rule occur. Within the realm of legal training, several jurisdictions outside of the US have been exploring the costs and benefits of requiring attorneys to complete graduate-level education as a condition of admittance to practice. Kim has written extensively on such developments in the Republic of Korea (South Korea), but other scholars have also noticed similar developments, primarily in East Asian jurisdictions. [14] In short, systems of legal training, much like legal systems themselves, display the sort of diversity and variation that we would expect from any compared population taken from globally-acquired samples. Nevertheless, research education remains a critical component of legal education, as research remains a critical component of the practice of law. The rest of this paper attempts to account for these distinctions while suggesting approaches to legal research instruction that might address the needs of various national (and international) bars and judiciaries.

2 Steps along the Road that Lies Ahead

Some of the work necessary for bringing Law Student Information Literacy into the training and practice of law around the globe has already been completed. Interestingly enough, both China and Turkey have experimented with early iterations of advanced legal research training between thirty to forty years ago, only to have placed these initiatives on hold until very recently. [15] Indian law librarians have recently called for more emphasis on information literacy in the law curriculum. [16] Dutch law professors and law librarians have long argued for the inclusion of information literacy in the legal curriculum. [17] Law librarians in Croatia and Slovenia have noted the need for building information literacy programs in law curricula in their nation. [18] The United Kingdom has adopted Information Literacy Standards through the British and Irish Association of Law Librarians (BIALL), in order to "enable law students, at both the academic and vocational stage of training, to develop comprehensive legal research skills following a five stage model." [19] The fact that the BIALL statement follows a five stage model in a manner similar to the Principles & Standards speaks less to the influence of the Principles & Standards *per se*, and more to the iterative nature of research in Common law jurisdictions, demonstrating the utility of such a model when legal research is a process as much as a task. [20] It should also surprise no one that separate Common law jurisdictions would have similar needs and similar issues when conducting legal research.

Likewise, it should surprise no one that Civil law and Common law practitioners would have differing needs and different issues when conducting legal research. To

this end, the five stage analytical model that provides the structure of the Principles & Standards as well as the BIALL statement may not be the most useful model for articulating legal information literacy in Civil law jurisdictions. This is a question that is most appropriately left to law librarians from Civilian jurisdictions, as they understand the needs of their patrons better than librarians from Common law or other types of jurisdictions. But it does seem to be the case that effective benchmarking of legal information literacy must be embedded in the training required to practice in a given jurisdiction, as research is a critical step in legal practice, and legal practice requires a jurisdiction, if not always national boundaries.

Public international law is a prime example of a jurisdiction that transcends boundaries. The International Association of Law Libraries has already issued research instruction guidelines for law librarians teaching that subject; not merely offering another example of benchmarking for legal research skills through instruction, but also providing another model for articulating such benchmarks. *Viz*., the IALL "guidelines follow the structure of [A]rticle 38 of the Statute of the International Court of Justice (ICJ)." [21] Basing research skills and instructional benchmarking explicitly from code text may well be the most suitable model for the articulation of Law Student Information Literacy among Civil law jurisdictions. But again, that is a decision best left to the law librarians who provide access to legal information and who train law students in those Civilian jurisdictions.

So, given these developments, where can Law Student Information Literacy go from here? The Principles & Standards were explicitly adopted "to foster best practices in law school curriculum development and design; to inform law firm planning, training and articulation of core competencies; to encourage bar admission committee evaluation of applicants' research skills; to inspire continuing legal education program development; and for use in law school accreditation standards review." [22] Note that none of these goals are exclusive to any jurisdiction, and indeed, many are common throughout differing jurisdictions. As a minor example, and for about 10 years as of this writing, the USA-based National Council of Bar Examiners has been contemplating the addition of a legal research examination to the Multi-State Exam that most US state jurisdictions require attorneys to pass in order to practice. [23] Alas, and much to the relief of American-trained law students everywhere, such an addition to the Multi-State Exam remains in development. Nevertheless, as this author has noted elsewhere, the development of the Principles and Standards represents "the beginning of a methodical approach to evaluating legal research competency." [24]

And a methodical approach to evaluating legal research skills, be it through the sort of frame offered by AALL and BIALL, or through a strategy embedded within code governing a Civilian jurisdiction, is the ultimate goal. Every librarian knows that decision-makers respond to data, but data is simply the information that emerges from that which we choose to measure. A methodological approach to evaluation of legal research skills and competencies is measurable, and can be used to create assessments that produce valuable data about our students' research abilities. Such assessments are at the heart of effective pedagogy.

But Law Student Information Literacy is not merely the result of any given student's choice to attend to the details of sources of legal information, including their access,

use, functions, and the responsibilities inherent in using them; it is also the result of larger policy choices that those parties who administer legal practice elect to adopt. Of course, each jurisdiction is free to choose this option or not, but this author certainly hopes that they will adopt policies that favor and encourage methodological approaches to evaluating legal research competency.

As a matter of policy, jurisdictions and those who govern them may choose to respond to exigencies beyond the purely academic. The phenomenon of "fake news" comes to mind here. Scholars have explicitly linked information literacy to a solution for the general problem of "fake news" [25]; but in the practice of law where information, and in particular, documents, may have the power to compel or restrict actions and behaviors, the need for information that tribunals can thoroughly rely upon becomes even more critical.

Additionally, the pervasive influence of search engines in legal research requires a focus on Law Student Information Literacy. Scholars have noted the broad variability of search results across the major electronic legal databases prevalent in the US, with different sources providing differing results for the same search terms. [26] Since these databases are, and are likely to remain, such essential tools for legal researchers, the value of a critical, metacognitive, and methodological approach to Law Student Information Literacy becomes even more significant. If the algorithms used by legal databases provide differing results for the same search terms (or if the results simply vary from vendor to vendor), attorneys must learn early in their careers to be skeptical of these results. Both Nevelow Mart and Wheeler note that these results do vary, for a variety of reasons. [27]

Fortunately, the practice of law has already adopted rules regarding the introduction of information into courts, tribunals, and other decision-making bodies. This is exactly why Law Student Information Literacy offers so much promise in this area: rather than discovering best practices for assessing and evaluating the reliability of information anew, we can look to rules and guidelines that have already served the practice for generations, and refer to them as we prepare today's students, who become tomorrow's members of the bench and bar.

3 Conclusion

Law Student Information Literacy has already shown itself to be an influential concept in legal research instruction in the US and the UK. It has influenced guidelines for international legal research, and it has been cited and referenced in several other jurisdictions. Given the nature of and reliance upon search engines and databases for legal research, the need for a systematic, methodological, and metacognitive approach to legal research instruction is essential, and focusing upon Law Student Information Literacy has provided the groundwork for such an approach.

But more work needs to be done. It is this author's hope that the paper will serve as the introduction to a monograph being planned as of this writing: an exploration of Law Student Information Literacy in legal research instruction around the world. Readers who have an interest in this field are invited to contact me directly and discuss the

possibility of contributing a chapter to this monograph. And all instructional law librarians, from all jurisdictions, should explore these topics in a manner that best suits their individual jurisdiction.

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Creating a Multilingual MOOC Content for Information Literacy: A Workflow

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Abstract. A massive open online course (MOOC) is an online space for learning with no prerequisites for entry. All content is delivered online and learners interact with the content by navigating through it, assessing their progress, writing down their knowledge, and sometimes interacting with other students. The European project Information Literacy Online is an example of a MOOC. It has a number of set goals: it should teach the basics of information literacy to undergraduate students, it should offer study in six European languages, it should deliver content that can be re-used, it should be used mostly by *self-paced* learners who progress at their own speed through the content, and subsequently assess and see their progress as they go.
The aim of this paper is to discuss how to build a multilingual MOOC in a location-independent and distributed collaboration scenario. The project requirements have shaped a content creation process, an authoring workflow, which we present in this paper. While the MOOC is delivered on the OpenEdX platform, the authoring workflow is centered around a versioning system which has allowed quality control processes, automated transformation processes, and the contribution of content from multiple places to occur in an asynchronous manner.
This paper describes the workflow, sketches the technical choices made in the process, the issues encountered and their workarounds and reports on the experience gained thus far.

Keywords: authoring · MOOC · multilingual · web-based

1 The Idea of a MOOC for Information Literacy and its Content Production Systems

A massive open online course (MOOC) is an online space for learning with no entry barriers. All content is delivered online and learners interact with the content

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by navigating through it, assessing their progress, writing down their knowledge, and sometimes interacting with other students. MOOCs have emerged from online learning systems as a distinctive way for self-regulated learners to enhance their knowledge using diverse sources. Based on the realisation that the online side of learning tools can scale massively, MOOCs started to emerge as an interesting complement or alternative to university courses [22].

Information Literacy (IL) is 'the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning' [1]. The project *information literacy online* (ILO) has a set objective of creating an open course where students anywhere in the world can learn the basics of IL. However, the required IL skills differ between different languages and cultures [20]. Thus, creating this MOOC implies to adapt it to multiple languages and local cultures.

While MOOCs developed in fields close to the open-educational-resources world [3], there is no requirement for them to be comprised of open educational resources or to make their content available under open licenses as noted by [4]. In the ILO project however, the open nature of the content is a requirement (inherited from the formal aspects of Erasmus+) and so the desire is to make the content more useful to the general public.

Both of these aspects introduce requirements on how the content should be organised when it is offered for re-use and when it is offered as a MOOC: the content should be easily extractable, and easily translatable. Moreover, enhancements to the content in one language should be made visible so that they can be translated to others.

The creation of MOOC content is rarely documented and the lack of such is highlighted in the literature review [22] who mention the *paucity of research examining instructor-related topics*. Most of the stages of e-learning content creation are applicable, e.g. as documented in [5] or [17]. Subsequently, very little literature can be found on the processes involved in creating MOOC content. While beginners' tools and methods exist such as [21] or [11], most tools remain close to the traditional online-learning environments with phases such as structure, gather, sketch, author, assemble, and revise.

Most of the literature that proposes a workflow for translations that we have found document language tools in action for the translation process (such as translation memories or grammar and spell checkers) but we have seen no statement about content organisation, except that they should be compatible with these tools, which requires simple content encoding.

The literature about the re-use of learning content has followed the seminal concept of learning object [23]. Re-usable learning objects are often studied in the world of open-educational resources, of which [4] is a recent description which highlights the role of re-using and re-mixing. The re-use model [12] has been an inspiration. Thus, the aim of this paper is to discuss how to build a multilingual MOOC in a location-independent and distributed collaboration scenario.

1.1 Outline

This paper starts by sketching the learning competencies and thus content objectives that we set forth for the realisation of the course: The specificities of learning information literacy are highlighted. In section 3, we outline the technical goals that we set forth to deliver a solution that can be sustained in the future. This is followed by a overview of relevant tools that were applicable in the project. Section 5.1 depicts the architecture of the system chosen to create and deliver our content followed by the description of the steps of a workflow from the first sketch until the realised MOOC. Finally, section 6 reports on the experience applying this workflow and the tools to create the content.

2 Content and Pedagogic Objectives of the MOOC on Information Literacy

In November 2016, the European Union funded project ILO was started with the aim to develop, evaluate and disseminate a multilingual open access MOOC designed to improve students' abilities to cope with the demands of today's information society.

IL as a social key competence is particularly essential in post-secondary education and research. According to many studies [16,15], student's IL levels are generally low. Most college curricula do not include content aimed at the development of IL, and the efforts libraries invest in IL seem to be insufficient. However, since the concept of IL is widely unknown outside of the information science community, an engaging tutorial is needed which can be developed on a broad range of available material. Thus, when considering these issues, MOOCs seem to be an ideal solution to develop IL [6].

An analysis of existing MOOCs on IL showed three major shortcomings [7]: First, existing courses tend not to emphasize country- and culture- specific dimensions of IL instruction. Usually existing courses are available in only one language and focus on resources suitable for the respective country. Second, existing courses tend not to emphasize subject-specific dimensions in their content. A few of the MOOCs only make a vague and short mention of subject-specific needs when dealing with information. Explicit chapters addressing these issues are missing in all of them. Third, quizzes are usually designed as single- or multiple-choice questions. They do not go as far as to provide real-world items, using already tested technical solutions.

Thus, the content of the ILO MOOC consists of both a generic section, which focuses on IL elements which are relevant for all subjects, and of subject-specific extensions. Examples for generic IL elements are Boolean operators or basic knowledge of copyright law. As it would be too ambitious to provide subject-specific extensions for all subjects/disciplines, the ILO MOOC focuses on Business Administration and Psychology. Guidelines are provided to encourage further subject-specific extensions in the future. A special aspect of the ILO project concerns offering the MOOC content for six European cultural and language

groups: English, German, Spanish, Catalan, Slovenian and Croatian. By addressing three of the largest language groups in Europe, the MOOC will be available to many citizens with different native languages. The multilingual approach of the content does not only consider formal translation but also cultural-specific differences in the various realizations. As existing IL MOOCs lack of more complex self-assessment possibilities, a central innovative approach of the ILO MOOC is the implementation of standardised technology based assessment components which allow students to get feedback on their learning success and hints on how to improve by taking advantage of scaling [8]; research such as [9] shows that the IL is often coupled to other forms of competencies.

The content framework of the ILO MOOC is based on the SCONUL Seven Pillars of Information Literacy [19], on the ACRL Framework for Information Literacy for Higher Education [2] and on the Metaliteracy model [10]. These concepts are integrated into the course objectives, learning outcomes and specific course units. The content does not only consider lower level IL skills (access to sources and finding information), but also IL skills on the higher level (evaluation, interpretation and use). A good practice analysis in IL education [18] was also an important guideline when designing the content framework.

On this basis, a content framework with the following modules was drafted:

- Module 1: Orienting in an information landscape
- Module 2: Research is a journey of inquiries
- Module 3: The power of search
- Module 4: Critical information appraisal
- Module 5: Information use: the right and fair way
- Module 6: Let's create something new based on information and share it!

The content of the modules was first collaboratively developed by the partners in English. A sketch was drafted and shared, before the more detailed content like videos and quizzes were developed. Each of these realizations was consolidated by the project partners, who commented on feasibility and corrected and enriched, where necessary. After that, the content was translated into German, Spanish, Catalan, Slovenian and Croatian by the local partner institutions. These translations also considered country- and culture-specific adaptations [13]. Such adaptations include changes of examples and exercises and references to country- and language-specific literature resources. For example, as the exercise 4.3.8 in the ILO MOOC students in the English version have to evaluate several citations from an English newspaper article. In the German version, these examples have been substituted with an German newspaper article.[3]

While the content framework of the ILO MOOC focuses on students, the MOOC is also intended to be available to all other interested groups, including but not limited to pupils, senior citizens and other educators. To allow the

[3] The content sketch of this exercise can be found under section 4.3.8 in the files `https://gitlab.tba-hosting.de/ilo-team/ilo-content/blob/master/4_Critical/4.3_Critical-Collaboration/4.3_Critical-Collaboration.md` and `https://gitlab.tba-hosting.de/ilo-team/ilo-content/blob/master/4_Critical/4.3_Critical-Collaboration/4.3_Critical-Collaboration_de.md`.

MOOC to be used in the most flexible manner, it is designed to be a self-paced MOOC, where learners are free to navigate through the content at their own pace without any restrictions. This shall also allow other educators to easily include the whole MOOC or only parts of it into their own teaching, e.g. through a blended-learning approach.

The content is provided through open licenses to encourage re-use and adaptation. To encourage this further, the content is not only available through a MOOC platform, but also through a public repository, which includes raw files that can be easily edited.

3 Technical and Sustainability Objectives of the MOOC

The following technical requirements have emerged as more or less natural consequences of the content and project objectives: On the delivery side:

- The ILO MOOC aims at being as open as possible, and therefore registration should be simple, requiring only a single registration form. This process should include the authorization of the user data collection and be accessible from any place.
- The ILO MOOC aims to offer content that is easy to access from any place and should thus support delivering the content on the web to devices as small as mobile phones and as big as large TVs. To this end, a design that responds to the various delivery channels should be adopted [14]. This puts requirements not only on the web servers but also limits the graphic design of the content, as overtly rich graphic elements are less responsive and may become unreadable when viewed in radically different environments.
- Because of the requirement for the MOOC to be self paced (see previous section), the ILO MOOC should offer ways for the students to track their progress. Information such as which quiz was taken successfully is important.
- As it aims to teach the art of manipulating information, the ILO MOOC should also be a model example in terms of insuring the privacy of users. Thus, on the contrary to most MOOCs, videos should not be delivered by popular video hosting services (that may collect user data as depicted, e.g. by [24]), but by more respectful means.
- Standardised assessment should be available to students, and delivered with as much fidelity as possible.
- Finally, the ILO MOOC should be able to be used in parallel with classroom learning. We estimate about 100 users to be a good minimum for a synchronous user-base. Moreover, the system should be sufficiently easy to maintain to be able to run for several years after its first installations.

On the authoring side, the distributed nature of the authoring team and its multilingual aspect allows us to formulate the following requirements:

- It should be possible for the content to be sketched, input, reviewed, and previewed in an almost synchronous manner using web based tools.

- Each step of the work performed by collaborators should be visible to others, even if considering it for inclusion after other changes have been made.
- Content sketching should be doable using a freely structured medium where only a human reader is enough.
- Content structuring and content entry should be made using agreed conventions that others can easily see and which allows others to find the content quickly.
- Content used for the input should be available for re-use as well as for consumption in a well-presented fashion.

Based on these requirements, we have analyzed that only the following content types will be supported within our MOOCs: texts (with a limited styling information), images (which may include tables), videos, quizzes and assessment. We have also concluded that a versioning system will be necessary to share and host the content.

4 Relevant Tools and Methods

In this section, we exhibit the tools and methods that we have found relevant for the realisation of the MOOC, and how they correspond to the requirements expressed in the two previous sections:

Sketching Tools for sketching are as flexible as possible so as to leave space for creativity before the technical constraints limit authors' intentions. Most authors, being used to word-processing tools, have found Microsoft Word (to draft initially) and Google Docs (to share and review) to be satisfactory tools.

Content Sharing While email exchanges have made the first steps and online editing tools such as Google Docs have allowed the sharing of sketches, this has not been satisfactory for sharing in a more controlled fashion where one needs the composition structure of collections or directories, plus a way to manage multiple author changes to the content, or perform other subsequent actions.

Content management systems are often used for content-sharing within teams and are the basis of multiple OER sharing platforms. However, content management systems generally lack programmable interfaces that allow complete collections of content to be read and maintained (e.g. to be served on the web). Versioning systems are also a common tool to this effect but they often require particular training. Thus far, the best compromise we have found is a versioning system that presents a web-interface where authors can also view and upload content, becoming a de-facto content-management-system. To date, the system we have found for this is GitLab. It allows modest version workflows (updates of text files, creation and updates of files, previews of some elementary types) to be performed and handles the display of changes in text files particularly well, e.g. encoding using the MarkDown format.

Content Processing The sharing of content is not sufficient to build a delivery. It still needs to be encoded in a delivery platform which requires its assembling using easily readable navigation structures, its re-encoding into a web-format, and its verification as an valid online content.

For **texts**, we have found the conversion of MS Word documents to be properly handled by the `soffice` command available with OpenOffice installations. It extracts raster pictures in PNG formats, vector pictures in SVG formats, and produces an HTML code that contains as much text as is found in the original file, except if tables are included. Obtaining HTML code is, however, not yet satisfactory to obtain a uniform presentation with only elementary styling. To this end, we have found the NodeJS library TurnDown to be relevant, it produces MarkDown out of HTML.

For **images**, authors are able to encode pictures into web-pictures, converting to PNG if needed. This ability goes hand in hand with the concerns of the limits of image sizes where readability can be a challenge: Authors who perform the conversion themselves can control the quality of the conversion result.

For **videos**, there is a contrary situation: video consumption is popular using online services while video reencoding is largely an uknown skill and requires an understanding of both the codec cultures and calculations for an acceptable web-delivery. While most MOOCs leave this work to online services, our wish to deliver videos and maintain users' privacy respect has brought us to process the videos ourselves. The `ffmpeg` command-line tool has offered us satisfactory means to create individual target files but we need to completed it with a streamlined encoding to downscale and re-encode to a "normally acceptable" web-format which simple browsers can show (e.g. through the use of the `video` element using a bandwidth of about 500 kbit/s on a video of about 800 pixels in side).

Standardised Assessment While the OpenEdX platform allows quiz contents, it does not allow the construction of assessment items which are satisfactory for the standardised psychometric assessments. Other learning management systems also do not. Among the reasons for this are flexible and faithful layout of the assessments, as well as the security of a delivery where all necessary content is readable. Other reasons include the need to collect detailed logs of the interactions for later data analysis and calibration.

As a result, not many solutions currently address the above issues. Thus, we have taken the same approach as [9] which has been reliable on multiple occasions: the CBA ItemBuilder and its execution-engine.

Delivery Engine Delivering content for each student in a way that allows them to control their progress, and allows the interactions we aim for (navigation and quizzes) is the traditional work of a learning management system: It involves registration, enrolment, content presentation, progress tracking, quiz display, and assessment display.

We have considered most contemporary learning management system systems on the critera of being translatable (and hopefully already translated

partly), being widely used, and supporting self-regulated courses. Among open-source choices major players appeared such as OpenEdX, Moodle, and Canvas. The first, OpenEdX, seems to be the most developed and most stable for the foreseeable future: Canvas appeared to carry considerably less translations efforts and Moodle's core technology, PHP, appeared to carry a higher security risk; moreover, OpenEdX involved the most modern use of JavaScript.

5 The Chosen Realisation Method for the ILO MOOC

In this section we describe the concrete aspects of our authoring workflow, embedded among its tools and its delivery environment.

The architecture is summarised in Figure 1.

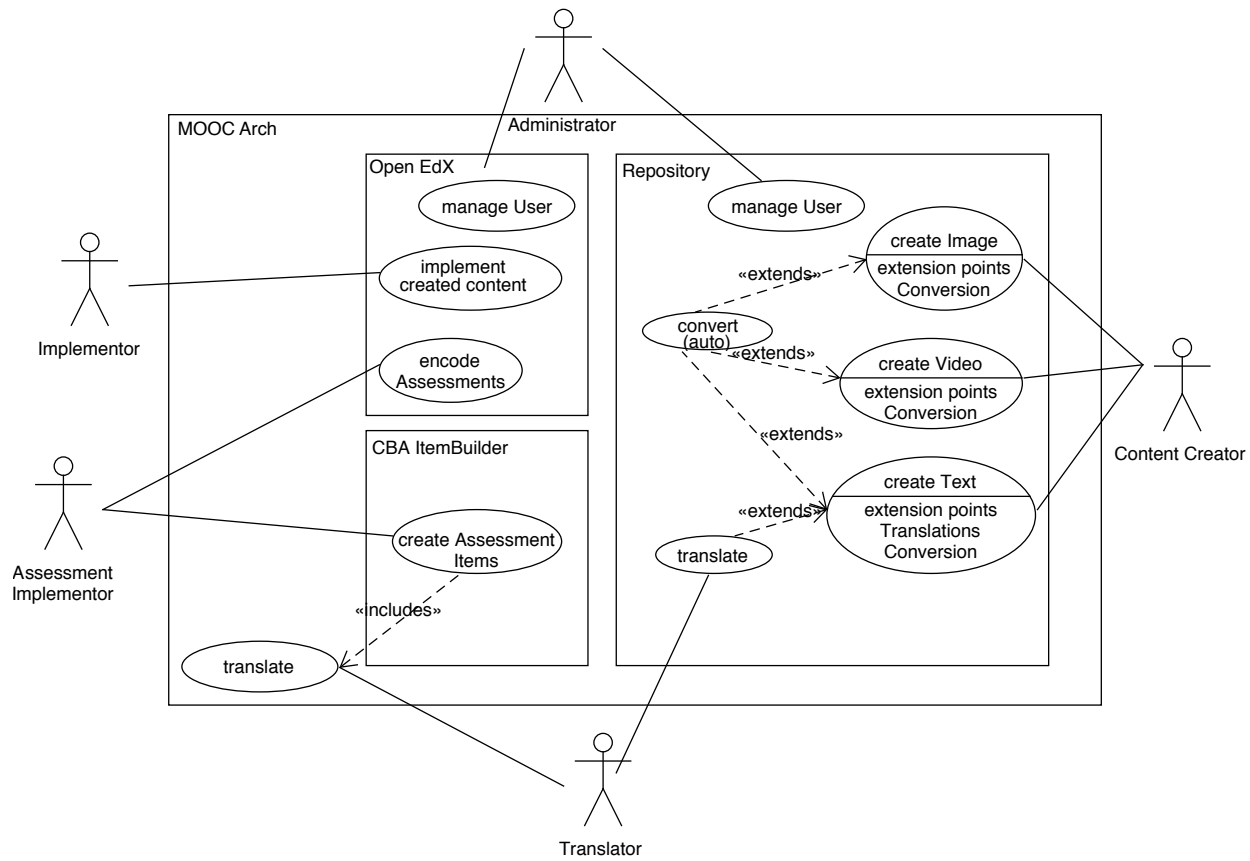

Fig. 1. Architecture of the authoring and delivery workflow of the ILO MOOC.

5.1 An Architecture for Delivering and Creating the MOOC

In order to deliver our MOOC, the choice of OpenEdX was compatible with our Linux hosting infrastructure. There are multiple ways to install the software, in a set of Docker containers – for local development, or as a native installation. We chose the native installation on a supported Ubuntu 16 system that met hardware

requirements of a dual-core processor and 8 GB memory. These dimensions have been sufficient although the virtualization still allows us to adjust the hardware if it appears necessary due to high runtime resource consumption..

The installation is heavily based on the automatic configuration management tool Ansible. This is used to automate the installation process, which has needed a number of subtle adjustments. It installs several components, of which the main ones are the learning management system (for delivery) and a content management system (the "studio", for authoring). We have not deployed other available application modules such as the Analytics or e-commerce modules. The use of the Analytics module is being considered in comparison to other analytics enablers; thus far the minimal self-regulation has appeared sufficient (display of the last visited section and the completed quizzes).

The included modules are Django apps. Django is a Python Web framework for building, installing and deploying web applications. The processes of these apps are controlled via Supervisor, a system that is dedicated to monitor and control a number of processes. Finally, all web-serving tasks are packaged by the webserver nginx, an open-source system that is known to scale well in very demanding conditions and cares for static assets (images, videos, scripts...). Altogether, the delivery environment offers us a manageable and upgradable installation, for which we shall be able to sustain long-term hosting.

One of the main obstacles we have faced is the translation of the platform. OpenEdX is delivered in English and relies on the online platform Transifex to include translators. While some languages such as French or Portuguese have a nearly complete translation, other languages that were relevant for the project, Croatian, Catalan, and Slovenian, are unfortunately missing almost all content. It has thus been decided not to use these translations. The effort to translate the platform has also been given up, as too little guidance is provided to link between the translations' sources and the aspects of the applications – and as incorporating the translations has been an error prone process.

As described above, we have selected the content sharing platform GitLab to share the content sources. The separate GitLab server has been configured with two repositories for the ILO MOOC content:

- a repository where **text and picture content** is hosted; in this repository, the semi-automatic translation from MS Word files to Markdown has supported the implementors in creating content sources with the intended and moderate amount styling. Copying and pasting from the rendering of Markdown files delivers HTML content which can be easily pasted within the OpenEdX studio. The repository can be seen at `https://gitlab.tba-hosting.de/ilo-team/ilo-content`.
- a repository for **videos** where source video files can be uploaded. This repository needed particular configurations to allow the upload of very large files (as big as 2GB), and to be endowed with an automatic process which converts the videos to web-friendly formats after a file has been uploaded. The repository can be seen at `https://gitlab.tba-hosting.de/ilo-team/ilo-videos`.

The separation allows the content repository to be copied in multiple places without taking up too much space on the disk. Both repositories are constantly *checked-out* on the web-server of the OpenEdX server so as to deliver the files.

Both servers are backed-up twofold. We are using the backup function integrated in our virtualization system (Proxmox) as well as rsnapshot. Restoring from backup has proved helpful while moving our servers to a new location or to give confidence while attempting complex installation processes such as the incorporation of new languages.

5.2 A Content Creation Workflow for Reusable MOOC Content

The content creation workflow has employed the following roles:

- Designer: The subject matter experts who sketch the content, inspired by other sources of content, in a way that is readable and sufficiently detailed so that the implementors can create a sequence of texts. In our project, the designers have produced Word files, uploaded them to GitLab's content repository, where they become converted to Markdown.
- Video producer: Video production is a domain in its own right for which the project has budgeted *on the side*. The result of a video production, which might also be the extraction of an existing video after having obtained permission, is uploaded to the separate video repository. Once uploaded it gets re-encoded to be web-suitable.
- Implementor: The implementors take as source the design documents and all media encoded in the content and video repositories and *deploy* it to the learning management system. Deploying means to create the necessary structure, as interpreted in the design, copy the content (from the GitLab preview of the Markdown text), and insert the pictures. This is presented in Figure 2. In the case of videos, the implementor uses the result of the video encoding process which delivers the HTML source that, in turn, delivers the self-hosted video using standardised HTML elements. Doing so, the implementors can preview the content as they write; the OpenEdX platform, for this purpose, is endowed with a rich preview functionality anchored in the studio.
- Translator: The translator has the mission to take the design text documents as well as all assessment text documents and translate them. Implementors then edit the copy of the English course content using the same implementation workflow.
- assessment implementor: Separate from the course content implementors, the project workers that encode the standardised assessments use a different tool as the OpenEdX platform. Texts written in Word files (and translated in these) are brought into the authoring environment and adjusted there.
- Administrator: The administrator assigns roles to individual persons, and supports their work,

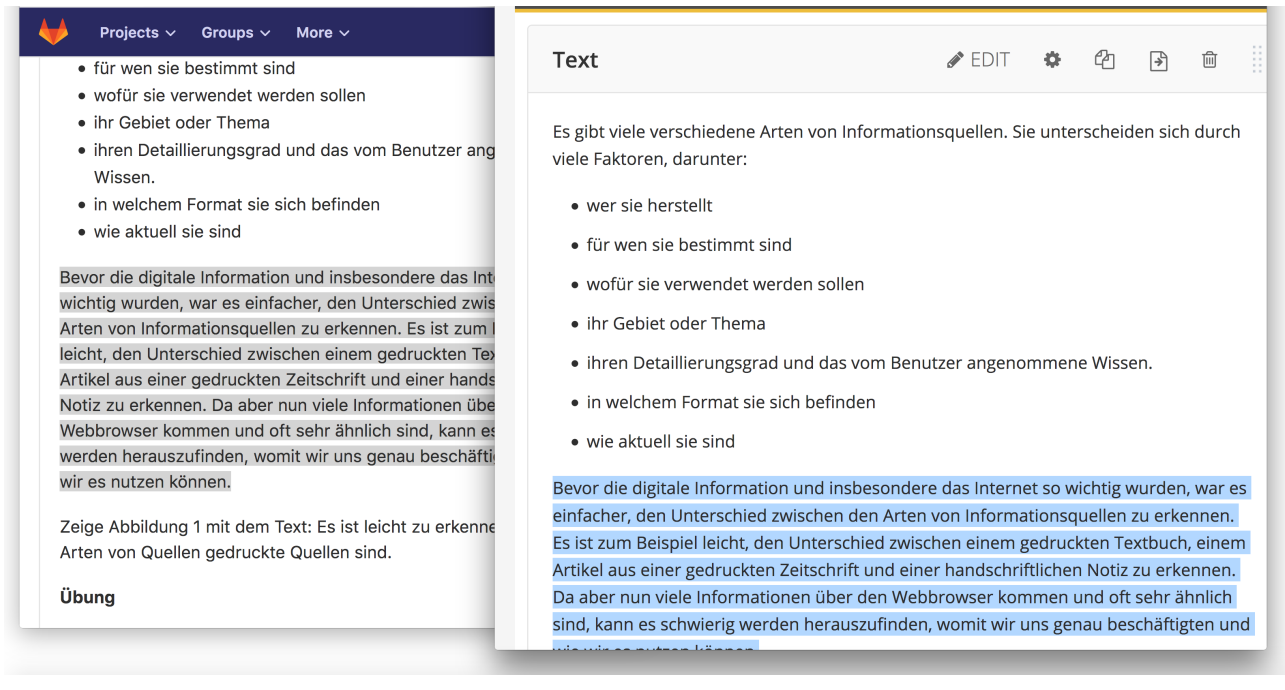

Fig. 2. Copy and pasting from GitLab's preview to OpenEdX studio, e.g. after a translation has been finalised. Note that the design is largely made of text but also contains textual hints about an insertion.

6 Experience Report on Creating the Content

The initial introduction of the workflow lead to some challenges and later adjustments. Not all of the involved partners had the same degree of technical background. Some partners had been overwhelmed with the use of the Markdown syntax and the functionality of GitLab. Thus, several workshops have been organized – both through Skype and in-person – to conduct the first steps together and address all arising questions and issues. The conversion of the already existing content within Microsoft Word to Markdown files turned out to be challenging and an automated conversion has been implemented, carried out after the files have been committed to GitLab. Some of the Word files had complex formats based on tables, that had to be reduced first to simpler formats. It also turned out to be necessary to agree on a common standard for the separation of the content chunks and the format of the file names implementors could understand the designers' sketches.

As OpenEdX uses a special syntax for creating the quizzes, these text elements were not ready to be copied directly, but needed further editing in OpenEdX To allow an easier transfer after future changes, e.g. the creation of translations, it became apparent that is was useful to copy these finished quizzes in the OpenEdX syntax back to the GitLab repository.

Besides technical challenges, the content production also turned out to be challenging regarding the workload. Producing a high quality MOOC content that includes all important information in a well-structured and bite-sized form proved to be much more challenging and time consuming than initially expected. Also, the translation process was more time-consuming than initially expected.

Terms have to be carefully dealt with, which requires translators that are aware of the subject. Cultural differences are not always obvious and thus need close consideration. Multimedia elements like videos and images need to be produced in a well coordinated form. But even then, they are time-consuming to re-produce in other languages [13].

Some issues emerged in the translating process of the videos included in the MOOC. First, a permission from the original authors to use the embedded videos under a CC-BY license was sought. However, even after some reminders the quota of responses remained at around half of the authors actually replying. For the videos with received permission for use, transcripts were created with the help of the video editing software Screencast-O-Matic which automatically generates captions. Even so, the automatically generated captions needed further editing as not every word or phrase was recognized properly or the captions did not match the time sequence. Still, after the completion of the English version of the captions in the video editing software, the translation to other languages proved to be rather simple as the framework for captions was already established and provided in a `.sbv` format. Using this `.sbv` file the translations simply had to be pasted in the right time sequence. The finished translation of the video could then be uploaded onto GitLab and integrated into OpenEdX.

While it was planned that all translation was conducted within the GitLab repository in copies of the original Markdown files, some partners preferred to download these files and conduct the translation in Microsoft Word. The use of the spell-checking and grammar-checking functionality, as well as track-changes mode for comments and corrections within Microsoft Word was one of the main reasons for this choice, as well as established workflow within some of the departments, where files are usually sent around and commented on by e-mail. The Word files were uploaded to GitLab afterwards and went again through the auto-conversion process.

Over all, the workflow turned out to be useful in terms of providing the content both in the form of easy-to-adopt raw files within a repository and on a MOOC platform at the same time. Nevertheless, a higher degree of automation would enhance its practicability even more. The need to copy the content of the Markdown files manually to the OpenEdX platform proves to be time-consuming and also needs careful consideration, as there is the risk that smaller changes in the Markdown files are not transferred to the actual MOOC immediately and get overlooked at a later point. An automated synchronization between the repository and OpenEdX might eliminate this issue. However, this would require the content designers to structure their content in advance in the right format.

7 Conclusion

The aim of this paper was to discuss how to build a multilingual MOOC in a location-independent and distributed collaboration scenario based on the workflow applied in the ILO project. The findings show, that a common approach is neccessary for the content sharing, content processing and content delivery

process. The ILO project used first E-Mail and Google Docs during sketching, but changed for the content creation process to create files in the MarkDown format hosted on GitLab, which allowed versioning and tracking of all changes. An automated video encoding was implemented to support video publishing. A lack of existing translations figured out to be a challenge when chosing the delivery engine. The ILO project finally decided on OpenEdX, which appeared to be the most developed and most stable solution on the long run. In the final stage of the publication process, the content has been copied from GitLab to OpenEdX. This process allowed to deliver a MOOC as well as open educational resources in a separate repository without entry barriers. The workflow turned out to be suitable for creating a multilingual MOOC among various involved partner institutions. Nevertheless, further automation regarding the automated transfer from changes in the repository to the MOOC platform itself might be desirable for future projects.

Contrary to many authoring efforts, the work distribution of the workflow does not impose a strict separation between the technical implementors and the designers of the content. And indeed, some of the partners insisted on writing their content in a more technical fashion, directly using HTML markup, while most others were comfortable with the simplicity of Markdown. Such a flexibility is allowed by the general purpose character of the tools used to collaborate, applying generic paradigms such as simple text encodings and copy and paste functionality to transfer between the different media.

Among the custom ingredients of this workflow, the facility to copy and paste was central but has represented an interesting challenge: At the start of the project, the up-to-date GitLab versions were fully compatible with it. Later versions appeared which changed the text when a Markdown rendering was copied: it was converted to a plain-text representation. We could interpret this as an attempt to make the Markdown preview be copy and paste-able further in Markdown; however this meant that efforts to copy and paste moderately-styled text failed. Small adjustments to the GitLab's JavaScript were needed in order to restore the original function.

The effectiveness of the learning content and the student satisfaction with the user interface of the MOOC is subject to future evaluations, that shall be carried out in the final phase of the ILO project. One of the particular aspects which this workflow has supported, the translation to the five other languages, is a challenging task as it is not clear that examples and/or cultural concepts can at all be translated. The evaluation shall also measure this aspect, especially for cultures where it is often common to have a part of the content seen on the web in another language.

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Information literacy and its interplay with AI

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Abstract. Information literacy (IL) [1] – and similarly digital literacy [2, 3] – want to convey skills to handle information and data, its use and the creation of new information and services. It emphasizes to teach competencies that enable learners to adapt to new environments and thus foster life-long learning. Artificial intelligence systems (AI) enter all kinds of areas, specifically the educational sector on all levels. For example, learning analytics and learning supportive services are established. Learners might see the opportunities of those services that promise to foster individual learning and skill development. At the same time, they need to develop novel kinds of literacy to understand and to apply AI. Thus, IL teaching and literacy frameworks need to consider an adaptation to recent changes that come with AI.
Our contribution wants to start a discussion within the IL expert field on how IL teaching needs to prepare learners for the new era of AI. We will discuss if IL teaching frameworks need to be adapted to foster AI literacy and moreover, how IL teaching concept can benefit from developments in AI. Based on a scoping review in AI in education, we will introduce current ideas of AI technology and applications and discuss them in relation to IL teaching schemes [2]. Following up the dialog of our IL working group [4], we want to contribute to current discussions on AI in education and the potential influence it might have on IL teaching, and reversely.

Keywords: information literacy teaching, information literacy framework, artificial intelligence, digital literacy, discussion paper

1 The interdependencies of IL and AI

Information literacy (IL) frameworks like the one from the Association of College & Research Libraries (ACRL) [1] have recently been updated to consider new aspects of relevant competencies that a literate person needs for addressing changes and developments in society and technology. Similarly, competencies for digital literate citizens are defined [2, 3] that stress the challenges of digital technologies and their enormous influence they will have for people and their lives. Artificial intelligence systems (AI) are one major achievement that will disrupt traditional ways of facing technologies and digital services in many fields. In this discussion, we want to focus

on changing ways of IL learning and teaching. Our question is: Does we need to adapt IL teaching to prepare for upcoming changes AI will bring in education? We argue to discuss two major aspects: First, the integration of AI might offer opportunities to foster learners' information literacy [4] and thus might be able to improve IL teaching as well. Second, AI requires new competencies for educators and learners that will need to handle, apply, and develop such tools. As such, IL teaching needs to convey those competencies to support the application of AI and life-long learning.

AI to support IL learning and teaching. AI has the opportunity to unleash the "black-box of learning" and help us to understand the learners' experience and how learning happens [5]. For example, AI systems might show ways to educators to apply effective teaching that allows learners to gain relevant skills like problem-solving or critical thinking. One example is intelligent agents, either robots or virtual assistants, which guide learners through their learning experience. IL teaching concepts applying those tools would be able to give timely feedback to educators and learners. AI could guide learners through information seeking processes and make them aware of obstacles and pitfalls. Such tools would need to have reliable indicators for learners' skill progress as well as effective teaching approaches [5]. Thus, IL needs to agree on concepts of information literacy evaluation [6, 7] to be able to automatically measure literacy with the help of AI. A challenge here might be the interdisciplinarity of the field, i.e. researchers and educators teaching IL have diverse backgrounds and goals, and one AI solution might not fit in all IL teaching scenarios. AI might as well be helpful in making learners' information behavior visible and counteract incorrect behavior immediately. A first step to integrate such tools would be to analyze learners' behavior and to use its results to expand IL concepts [8]. Recent examples are context-based information behavior approaches like in health literacy research [10]. In the context of learning and teaching, learning analytics are an option to study learners' behavior and skills [13].

IL to support AI. If AI shall support IL educators in offering individual and personalized teaching learning and teaching, educators need to have the competencies to apply and evaluate such systems. That is, a system's intelligence needs to be visible and transparent, and enable users to recognize its scope and goals [9]. This presumes that users are willing to critically engage with the system rather than just to consume information. Thus, IL needs to consider emerging technology literacy [11] with a focus on data and information creation processes with AI. Besides information literacy, AI requires user empowerment and the ability of self-management as well. AI systems will make finding relevant personalized information easier. They will be able to use huge amount of data to support users in their decision making processes, much faster than users themselves can do. As such, they are tempting users to just use information without considering the steps an information literate person should go through to interpret information judiciously [12]. Badke emphasizes that "[one day] [y]ou don't need training because the search tools do everything for you" [14]. IL teaching needs to consider this human information behavior in its contexts to make learners aware of their own information empowerment. At the end, IL frameworks and teaching con-

cepts need to set the baseline to teach competencies that make learners aware of AI tools and their intentions and improve their skills to responsibly apply AI.

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Panel: What do we mean when we talk about IL?

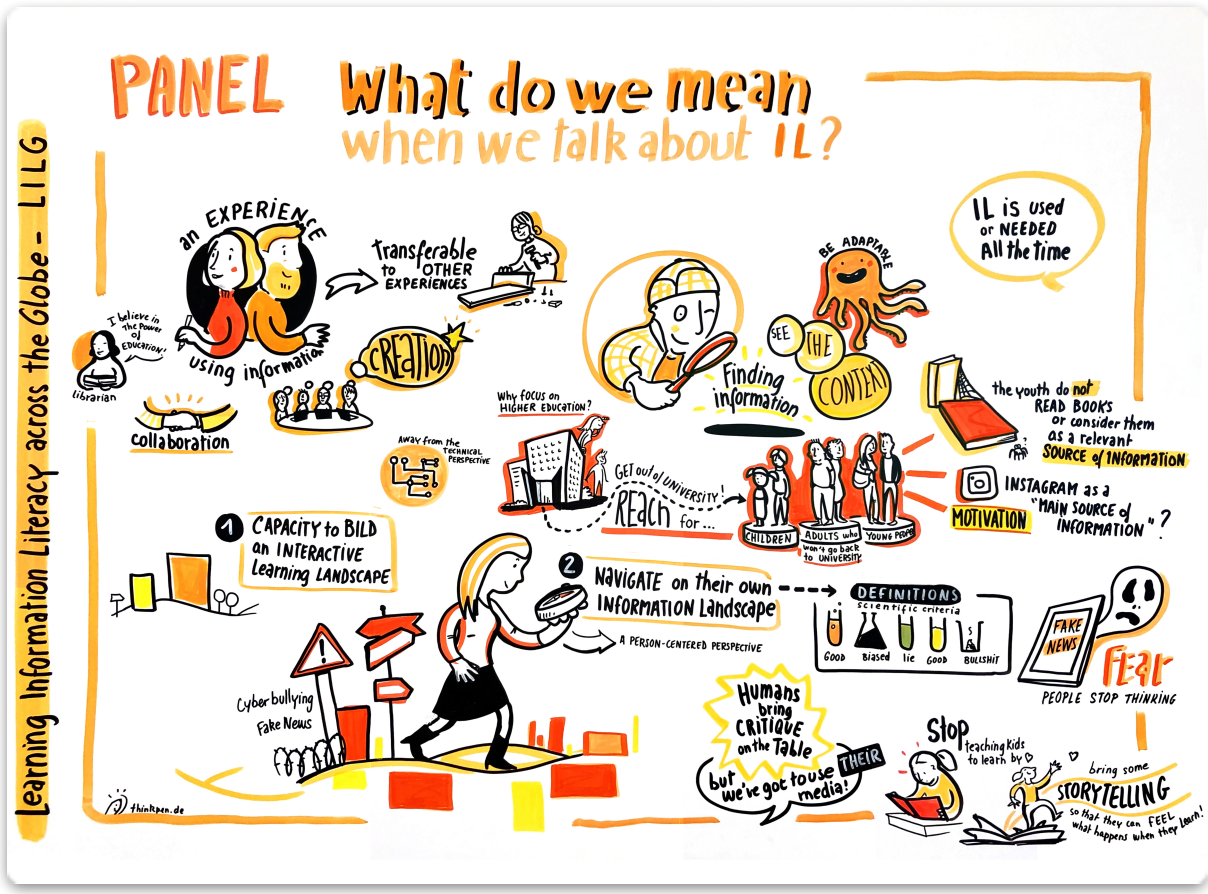
moderated by Maja Žumer (Uni Ljubljana)
and Alexander Botte (DIPF)

with guests (left to right):

- Jan Schneider (DIPF)
- Jannica Heinstrom (Abo Akademy)
- Stefan Dreisiebner (Uni Graz)

- Hosts: Alexander Botte (DIPF)
  and Maja Zumer (Uni Ljubljana)

- Trudi Jacobson (Uni Albany)
- Andrew Whitworth (Uni Manchester)
- Shirley Chiu-Wing Wong
  (Polytech Hong-Kong)



The keynotes and panels are not available in printed full text. They can only be followed by the movie recording which can be accessed at informationliteracy.eu/conference/ .

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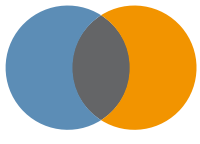

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