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In diesem Journal mache ich in Textform öffentlich, was mir wichtig erscheint: (a) Gedanken, bei denen ich so weit bin, dass sie sich für mehr als Blog-Posts eignen, (b) Texte, die aus diversen Gründen noch nicht geeignet sind für andere Publikationsorgane, (c) Texte, die in Reviews abgelehnt wurden oder infolge von Reviews so weit hätten verändert werden müssen, dass es meinen Intentionen nicht mehr entspricht, (d) Texte mit hoher Aktualität, für welche andere Publikationswege zu langsam sind, (e) inhaltlich passende Textbeiträge von anderen Autorinnen. Genderschreibweise und Textlänge sind bewusst variabel und können frei gewählt werden.

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Designing individualized digital learning environments in ILIAS using ladders of learning: Practical experiences from University of Passau

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Introduction

In the 21st century, learning has to be increasingly individualized and provided in digital formats. Many German universities use ILIAS, a Learning Management Systems (LMS), as digital learning environment to provide learning material, communication, and assessment for off-line courses. More and more is ILIAS used to support courses that are taught partially of fully online. However, designing individualized digital learning environments is a challenging task. In this contribution, we argue that ladders of learning are a solid tool to scaffold the designing process of individualized digital learning environments with ILIAS. Ladders of learning are a feature of a learning method called Multi-grade Multi-level-Method (MGML) (Rishi Valley Institute for Educational Resources, 2016).

In the following, first we review the discussion on individualized digital learning environments and the usage of ILIAS to create them. Second, we briefly describe ladders of learning and explore them as a tool to design individualized digital learning environments with ILIAS. Third, practical experiences with using ladders of learning to design individualized digital learning environments with ILIAS from University of Passau are presented. Fourth, the contribution closes with summarizing the experiences gained within the different courses based on the Multi-grade Multi-level-Method.

Individualized digital learning environments

As multiple researchers from the field of learning sciences could show, there are certain core aspects to achieve effective learning (Lees 2016; Sawyer 2014). These core aspects seem to be that individual differences among students are considered (Fereidooni, 2012; Klippert 2012), the teacher facilitates rather than lectures (Conner und Sliwka, 2014), and student assessment is performed in a formative way (Pellegrino, 2014). These aspects become even more important in diverse learning groups. In addition, international organizations (e.g. UNESCO, OECD) have called for the establishment of learning cultures for the 21st century (Rivas, 2021; Scott, 2015; OECD, 2015). At the core of such 21st century learning cultures is the combination of individualized learning with digital formats (Thomas & Brown, 2011).

The Learning Management System ILIAS

Many German universities use web-based Learning Management Systems (LMS) as digital learning environments to support off-line teaching, usually to provide learning material. One widely used LMS is ILIAS (*Integriertes Lern-, Informations- und Arbeitskooperations-System*). ILIAS supports learning content management and tools for collaboration, communication, and assessment.

More and more is ILIAS used to support courses, which are taught partially or fully online. ILIAS offers many features necessary to digitally enrich face-to-face teaching or even implement courses completely online, which are among others:

- ILIAS represents a powerful examination tool that allows both the checking of one's own learning status and the execution of complete e-examinations.
- ILIAS offers flexible course management for a wide range of didactic scenarios such as blended learning, inverted classroom, hybrid teaching, etc.
- ILIAS enables the creation of learning and practice materials with numerous integrated authoring tools such as learning modules, wikis, glossaries, tests, surveys, portfolios and much more.
- In ILIAS, learners have a Personal Workspace where portfolios and blogs can be created quickly.
- ILIAS enables the exchange of content with lightning-fast file upload via drag & drop.
- Based on a powerful rights system, access and usage options for all content and tools

can be precisely controlled in ILIAS (ILIAS open source e-Learning e.V., 2022).

What are the challenges when it comes to designing individualized learning environments? Usually online teaching is a new format for most university teachers in Germany. Online teaching is mainly practiced at German universities since the outbreak of the corona pandemic in early 2020. This is why many university teachers lack pedagogical knowledge about individualized digital formats as well as technological knowledge on LMSs and its features for online teaching.

Ladders of learning

We argue that ladders of learning are a solid tool to scaffold the designing process of individualized digital learning environments with ILIAS. Ladders of learning are a feature of a learning method called *Multi-Grade Multi-Level Method* (MGML). MGML is an approach, which was developed by the *Rishi Valley Institute for Educational Resources* to support teachers in multi-grade classrooms (Girg & Müller, 2010; Müller et al., 2015; Rishi Valley Institute for Educational Resources, 2016). The challenge of multi-grade classrooms (also known as mixed age or vertically grouped classrooms) is that one teacher is responsible for the learning of children with varying ages and ability who would normally be considered as belonging to different grades (Angela Little, 2006). MGML is based on a set of activity cards, which are structured through ladders of learning. Students proceed in their individual speed on the ladder of learning. Ladders of learning are a tool to structure the learning process, to visualize the learning curriculum and to trace the learning trajectory of students (Girg & Müller, 2010; Girg et al., 2012; Müller et al., 2015).

Ladders on learning consist of several consecutive so-called milestones. Milestones are conceptualized as a five-step-process, which allows for individualized learning. A milestone is structured the following way:

1. Introduction
2. Practice
3. Evaluation
4. Remediation
5. Enrichment activities

Each milestone makes use of learning material, which is usually provided in form of activity

cards. The set of activity cards is fully systematized through symbol on the ladder of learning which correspond to specific activity cards.
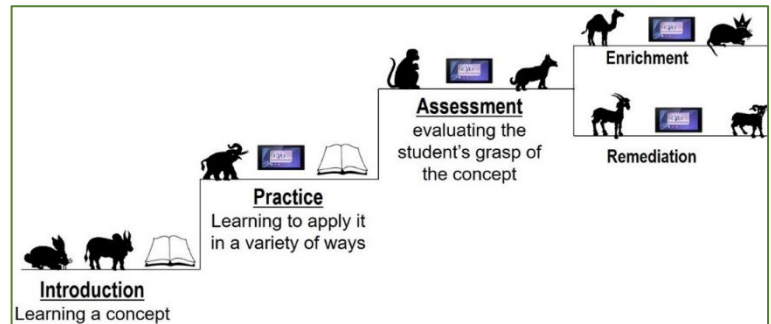

Figure 1: Milestone Structure as five-step-process. (Source: Rishi Valley Institute for Educational Resources (2016))

The introductory part of a milestone serves as opening for a new topic. Often this part of the milestone uses learning material, which is presented by the teacher, or students which have already mastered the learning content. After the introduction, learning material is provided which makes the students allows the student to practice the introduced learning content. After extensive practice, students evaluate their learning progress through assessment tasks. Evaluation tasks are conceptualized on varying competence levels e.g. easy allocation tasks, independent description of learning contents, application of theoretical knowledge, etc. The results of the evaluation tasks give the learner feedback about their individual learning process and the next learning steps. Milestones make individualized learning possible through offering differentiated learning material; one the one hand, learning activities which allow for further practice are available. On the other hand, learning activities that extend knowledge further are provided through enrichment material. Through proceeding on the ladder of learning students document their learning process individually and are able to reflect on their learning process (Rachbauer et al. 2021; Rishi Valley Institute for Educational Resources 2016).

Using Ladders of Learning to design individualized digital learning environments with ILIAS

Ladders of learning seem to offer a pragmatic approach to scaffold the designing process of individualized digital learning environments with ILIAS (Rachbauer et al., 2021). This seems to be the case, since, first, ladders of learning provide an easy template for individualized

learning, be it on-line or off-line. Second, the structure of the ladder allows for a comprehensive visualization of the course content and connects the underlying sub-fields. Third, through the consecutive milestones are specific learning objectives defined which guide the students learning process. Learning objectives function is this regard as checkpoints for students to assess the progress of their learning process. Fourth, the internal five-step-structure of a milestone responds to the reality of heterogeneous groups and allows individualized learning based on each student's competence level and allows students to choose their individual paths through the learning material depending on their prior knowledge, experience or personal preference. Fifth, through using learning material which has been designed to indicate if the learning objectives have been reached, assessment is provided in a formative way. Sixth, the individual learning progress is indicated through visualizing the completion of sub-fields in the digital learning environment. Seventh, all the classic features of ILIAS can still be used for communication, grading, and material organization.

Overall, we conclude that ladders of learning are a pragmatic and low-key tool to scaffold the designing process of individualized digital learning environments with ILIAS from which especially inexperienced teachers can benefit.

Individualized digital learning environments at University of Passau

„Das Corona Virus beeinträchtigt den Campusbetrieb auf unabsehbare Zeit. Unsere Anstrengungen richten wir deshalb darauf, dass die Dozierenden und Studierenden trotz der schwierigen Umstände den Lehr- und Lernbetrieb aufrechterhalten können. [...] Langfristig arbeitet das Di-Tech-Team an Strategien für eine erfolgreiche Hochschuldidaktik im Zeitalter der Digitalisierung. Ziel ist es, nachhaltig traditionelle Lehre mit den Vorteilen digitaler Bildung in Einklang zu bringen" (DiTech, 2020).

A short summary of how ILIAS is used at the University of Passau

At the University of Passau, ILIAS is used to either hold courses with the support of digital media or to implement courses completely online. Due to the current situation, the focus has been primarily on online teaching since the summer semester 2020.

The following functions of ILIAS are used at the University of Passau, among others:

- Course registration and course organisation
- File storage and communication
- Use of media casts (podcasts, vodcasts)
- Blended learning: multimedia learning materials alternating with attendance phases
- Virtual modules and lectures
- Conducting C-tests (English, Italian, Spanish and French placement tests)
- Tests and assessment

Students use ILIAS to

- retrieve learning materials
- use them actively or interactively, for example in the form of discussion forums
- as well as to create wikis, test items, Media Casts and blogs.

Lecturers use ILIAS to

- quickly create and make available teaching and learning materials for e-learning purposes on the Internet
- transfer selected face-to-face events to the virtual space, for example by recording lectures
- plan and implement blended learning concepts

University groups use ILIAS to

- create surveys
- use wikis and thus improve knowledge management in the long term
- promote media pools and file sharing in general
- manage mailing lists and improve communication in general.

ILIAS thus represents an interactive communication tool for the University of Passau, which makes the exchange via blogs, forums and comment functions multidirectional and thus meets the standards of modern internet communication.

Examples of using Ladders of Learning for designing Individualized Digital Learning Environments in ILIAS

2020: First experiments with individualized digital learning environments

The concept of digital learning landscapes was tested for the first time at the University of Passau in the summer semester of 2020 in the form of two different online courses on the topics of "Central questions and methods of primary school research" and on "Musicological work digital and online" (Rachbauer, Lichtinger, &

Lermer, 2021). The students actively worked on the online self-study course during the semester, which was specifically implemented with the Learning Management System (LMS) ILIAS, but were able to access the content for another semester. At regular weekly intervals, the students were given a lesson with work assignments in the ILIAS learning management system, which they then actively worked on in self-study. If questions arose, the students could contact the supervising lecturers via various channels in the LMS such as forum, chat or online consultation hours. The LMS ILIAS was used as the learning platform, as this is one of the central platforms at the University of Passau (Rachbauer, Lichtinger, & Lermer, 2021).

Due to the predominantly positive feedback from the students, the two courses have been held in this form every semester since the winter semester 2020/21.

2021: Advancements in Individualized Digital Learning Environments

For the summer semester 2021, another two online courses were developed based on the concept of digital learning landscapes in the same way as the two modules described above. These two courses on the topics of "Introduction to Scientific Work" and "E-portfolio-supported reflection in the professionalization process of teacher education" are explained in more detail below.

Within the context of their studies, students must acquire a total of five credit points in the free area before they can register for the final state examination. For this purpose, the various chairs at the University of Passau offer different workshops and courses, as in the present case, the two courses on the topics of "Introduction to Scientific Work" and "E-portfolio-supported reflection in the professionalization process of teacher education" (ZLF, 2021).

The online course "Introduction to Scientific Work"

The course project on scientific work arose out of the necessity that students in the teacher training programme for primary school education have hardly any experience in the area of scientific work or have not been confronted with scientific work during their time at school. The quality of the seminar papers is correspondingly poor. Since there is no time in the regular

courses for a corresponding introduction to scientific work, and such an introduction is also not provided for in the module plans, the idea arose to design a corresponding course that can be integrated into the course of study in such a way that the students are not additionally burdened, but in a way that they can use this course as a companion for their seminar papers in the regular courses. For this reason, the course "Introduction to Scientific Work" was specifically designed as an online self-learning course based on the concept of digital learning landscapes in order to offer students the greatest possible flexibility and the best possible support in terms of study ability.

Precisely because the course is designed based on the concept of digital learning landscapes, it is important to explain to students,

1. how the course is structured and runs in detail, in other words, what exactly it means that digital learning landscapes are used,
2. how supervision and communication will take place, especially via the LMS ILIAS,
3. which certificates of achievement are to be provided and
4. what learning objectives and competences are to be achieved.

That this clarification is necessary was also clearly shown by the experiences from the other two courses on the topic of "Central questions and methods of primary school research" and on the topic of "Musicological work digital and online" (Rachbauer, Lichtinger, & Lermer, 2021). For this reason, a (virtual) synchronous information event was also held via the web conference tool ZOOM before the start of the course on scientific work in order to inform the students about the four points just mentioned.

In overall, the course is divided into the following four topic blocks, according to which the online self-study course implemented in the LMS ILIAS is also implemented:

-   1st topic block - preliminary work: choice of topic, initial orientation, literature research, sifting through, sorting and evaluating literature
-   2nd topic block - main work: structure, table of contents, bibliography, introduction, main section, conclusion
-   3rd topic block - fine-tuning: correct citation, formatting, style, figures and tables
-   4th topic block - Excursus: using plagiarism scanners, interpreting results.

Especially for more extensive online self-study courses that are structured thematically and should offer a visually appealing overview of the topics, the page layout is suitable in the LMS ILIAS or the Grid format in the LMS Moodle. In this way, the students first see which topic blocks there are to be taken.

By using the page layout, the entire learning material can be divided into four clearly arranged topic blocks or sub-areas. Each thematic block is again divided into building blocks to be worked on one after the other, the working materials and activities. Following the milestones of the digital learning landscapes, these building blocks divide each thematic block into

- an introductory element (Introductory) - IL-IAS objects folder, content page, files, weblink, media pool, learning module
- an exercise/task (reinforcement or practice) - ILIAS object exercise
- an evaluation (evaluation of the intended goal) and, depending on the result of the evaluation, a repetition or advancement (Remedial) - ILIAS object Test
- or a deepening or broadening (Enrichment activities) – ILIAS Objects folder, content page, files, weblink

Upon completion of the four topic blocks, students have the option of either working through them completely in self-study (corresponding slide sets and video tutorials are available) or participating in one (virtual) classroom session per topic block. In this face-to-face session, the same content is presented as in the video tutorials and on the slide sets for self-study, but in contrast to pure self-study, the students can ask specific questions.

In addition, the respective performance certificates that are necessary to obtain the two credit points in the free area are summarized again specifically for each topic block (ZLF, 2021).

The online course "E-portfolio-supported reflection in the professionalization process of teacher education"

The course entitled "E-portfolio-supported reflection in the professionalization process of teacher education" is a prerequisite for the other courses of the primary school teacher training programme at the University of Passau. In these courses, it is assumed that students are familiar with e-portfolio and reflection work and thus with creating, sharing, designing and putting online a portfolio as well as writing reflections as a workload.

As with the first course on academic work described above, this course was also implemented as an online self-learning course based on the concept of digital learning landscapes in order to offer students the greatest possible flexibility in integrating it into their timetable.

The e-portfolio course is structured in such a way that the students work out in self-study in five individual sections how the e-portfolio work proceeds, which requirements are associated with it and how they have to write/structure their reflections in terms of content. This theoretical input is followed in the practical part by the step-by-step creation of the e-portfolio in the LMS ILIAS with all the necessary settings like the design, the uploading of content and the official submission of the e-portfolio:

- Topic 1 - Customizing your profile settings: How do I customise the profile settings (=cover sheet) of my portfolio?
- 2nd topic block - Creating the e-portfolio and release: How do I create my e-portfolio with cover sheet, process and product part from the e-portfolio template? How do I release my e-portfolio to my lecturer and put it online for assessment?
- Topic block 3 - Writing an opening reflection in the form of a PDF file: How do I go about writing reflections?
- Topic 4 - Integrating the written (self-)reflection in the form of a PDF file into the e-portfolio: How do I include a PDF file in my portfolio?
- Topic 5 - Submitting the e-portfolio in IL-IAS: How do I submit my finished portfolio for assessment?

Each section is based on the concept of the learning leaders and thus follows the milestones, as is the above described course on scientific work, divided into

- an introductory element (Introductory) - IL-IAS objects folder, content page, files, weblink, media pool
- an exercise/task (reinforcement or practice) - ILIAS object exercise
- an evaluation (evaluation of the intended goal) and, depending on the result of the evaluation, a repetition or advancement (Remedial) - ILIAS objects test, survey

- or a deepening or broadening (Enrichment activities) – ILIAS objects folder, content page, files, weblink, media pool, learning module

Students will receive appropriate feedback from the course supervisor regarding completeness, depth of written reflections, etc. on the submitted e-portfolio. In order to receive the two credit points in the free area, the students must also implement the comments as well as the feedback.

Upon completion of the five topic blocks, students have, in the same way as in the course "Introduction to Scientific Work", the option of either working through the five topics completely in self-study or participating in one (virtual) classroom session per topic block.

Conclusion

As we could show, ladders of learning are a suitable tool to scaffold the designing process of individualized digital learning environments with ILIAS.

Summarizing, the implementation of the two new courses based on the digital learning landscapes worked very well! The quality of the results from the work assignments by the students has clearly shown that students get on very well with the digital learning landscapes. Moreover, they have more than appreciated the flexibility in terms of study-ability and thus the choice of the digital learning landscapes.

On the basis of the experience gained with the two courses on "Central Issues and Methods in Primary School Research" and on "Musicological Work Digitally and Online" (Rachbauer, Lichtinger, & Lermer, 2021), which have been held since the summer semester 2020, as well as the newly conceived topics "Introduction to Scientific Work" and "E-portfolio-supported reflection in the professionalization process of teacher education", which were first held in the summer semester 2022, teachers must specifically become aware of the fact that

- it is of central importance, before the actual technical implementation of the online self-study course, to plan precisely how the learning material can be sensibly structured into small, coordinated units, and
- the course quality as well as the creative/appealing design of a digital event is dependent on the tools and instruments that the

lecturers have at their disposal for the creation of learning materials. It is therefore all the more important that lecturers are familiar with the learning management system used at the respective university. Normally, there are special institutions that offer training and further education on the systems used for lecturers and support them in their implementation.

All in all, the use of digital learning landscapes has been worthwhile or is worthwhile, as the positive feedback from students and the quality of their homework/seminar work has shown or shows. The same goes with the quality of the e-portfolios and the written reflections. Nevertheless, lecturers have to reckon with increased effort when designing an online self-learning course based on the digital learning landscapes for the first time. However, once the respective course has been created, it can be reused with minor adjustments (current studies, texts...), which minimises the amount of work, especially in the following semesters.

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