

Rethinking Self-directed Learning for Information Managers

- A process model for self-learning materials regarding the degree of complexity -

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Abstract - Self-directed learning is an essential basis for lifelong learning and requires constantly changing, target group-specific and personalized prerequisites in order to motivate people to deal with modern learning content, not to overburden them and yet to adequately convey complex contexts. Current challenges in dealing with digital resources such as information overload, reduction of complexity and focus, motivation to learn, self-control or psychological wellbeing are taken up in the conception of learning settings within our QpLuS IM project for the study program Information Management and Information Management extra-occupational (IM) at the University of Applied Sciences and Arts Hannover. We present an interactive video on the functionality of search engines as a practical example of a medially high-quality and focused self-learning format that has been methodically produced in line with our agile, media-didactic process and stage model of complexity levels.

Keywords - *Self-directed Learning; Information Management; Reduction of Complexity; high-quality Learning Formats; Constructive Alignment; Motivation; Media Didactic Concept; Digital Wellbeing.*

I. INTRODUCTION

As part of the QpLuS IM [1] project, the bachelor's degree programs Information Management and Information Management extra-occupational (IM) at the University of Applied Sciences and Arts Hannover will be further developed with regard to their competence profiles, blended learning scenarios and assessments. The focus is on the support of competence development of students through self-directed learning in digital learning scenarios. In this way, the degree programs contribute to a modern securing of skilled labor by addressing different target groups of prospective students. The courses of study support and accompany the development of students' self-control competences as information managers in digital learning formats.

A. Reduction and Complexity

On the one hand, e.g., in the case of technical topics, a reduction in complexity is required in order to facilitate access to more in-depth content with an increasing degree of self-regulation. On the other hand, a flexible deepening of the content by exploring further learning resources (as text, audio, video, animation, website, book, blog, etc.) should be possible at any time, if the learner wishes or if it is necessary for the subject. Within the context of a media-didactic concept for newly conceived, self-directed learning scenarios in the

Information Management course of studies (regular and extra-occupational), we develop an agile, multidimensional process model taking into account complexity reduction as an ambivalent construct in learning settings. Our target group, the students of Information Management and Information Management extra-occupational, focuses on mediality (interactivity, multimodality, design quality), adaptive, competence-oriented (low-threshold to profound) information access (complexity, information reduction) and cognitive/psychological dimensions (degree of self-control, attention span and learning motivation). Digital Wellbeing and mental health play an increasingly central role in the context of the educational society, aggravated by the corona crisis, and must no longer be missing as a superordinate cross-cutting theme in learning, working and leisure. The media-didactic concept for self-directed learning described here was already developed before Corona, but the Corona crisis has intensified the focused aspects and made them even more concise in dealing with online teaching.

B. A Media-didactic Concept for Information Management Students

Blended learning and self-directed learning are not new learning/teaching concepts. Nevertheless, it is currently becoming clearer than ever that these traditional teaching/learning concepts must face new challenges in order to be successful and healthy in the long term. Current characteristics, as well as problems in dealing with digital media (also social media) and interaction must be taken up and considered in innovative learning settings in order to support the target group of students (in our case) cognitively and medially where they are competent.

Digital competence or media competence is now so complex, that not all students can always keep up with the immense digital dynamics that can suddenly be experienced at universities due to corona. The variety of tools and the great creativity of the teachers sometimes seem chaotic, over-enthusiastic and confusing from the students' point of view. The high degree of self-control, that is suddenly demanded of students in the context of exams by activating digital learning formats and tools is sometimes perceived by our students as strenuous and as more work than face-to-face courses. The real contact to fellow students and teachers is missing for perfect communication.

From first evaluations, we learn that some students wish to have the pre-corona back. Nevertheless, we will continue the increased use of digital learning/teaching resources in a

meaningful way, but hopefully gradually supplement this with more face-to-face sessions. There must now be order in the digital tool chaos, but here at University of Applied Sciences in Arts Hannover, the central choice has already been made for Moodle [2], BigBlueButton [3] and Zoom [4], so that structure is now in place.

Now, we have to reduce the hot-needle emergency online mode with more attention to detail and focus on learning goals and skills to be promoted in order not to lose or regain the trust and interest of the students. The boundaries between work and leisure time have long since become blurred and the consequences can be felt by every individual.

The paper is structured as follows: in Section II, we present the current state of research on self-regulated learning. In the following section III, we introduce our own developed process model for self-directed learning against the background of mediality, complexity and learning motivation. The section is divided into the subsections A (Process model for learning assets) and B (Four levels of complexity). Section IV discusses the importance of digital focusing and reduction, with regard to mini-lectures and digital wellbeing. This section is also divided into two subsections. Subsection A deals with multitasking and overwhelming and subsection B deals with the balancing act of dealing with information and complexity. The reference to practice then arises in Section V, in which our interactive video entitled *How Search Engines Work* is explained didactically, technically and aesthetically. Section VI forms the conclusion and outlook on how digital self-learning materials can be effectively used for information managers in the future in terms of media didactics.

II. STATE OF RESEARCH: DIMENSIONS OF SELF-REGULATED LEARNING

Self-directed learning requires modern conditions adapted to the target group of our students in order to be successful in the currently very dynamic teaching and learning environment. Dyrna and Riedel [5] describe it aptly:

"Self-directed learning is a goal-oriented, multi-dimensional process in which learners subjectively recognise, master and use the didactic scope for decision making, design and action that objectively exists with regard to the goals, content, sources, methodology, assessment, partners, the path, time and place of their learning. The greater the use of this scope, the more self-directed the learning process is."

Besides the specific design of a media learning offer, as well as the methodical-didactical embedding of learning media in a learning arrangement, various personality traits of the learners are also important, they continue to write. [5]

In Constructive Alignment [6] [9], we see a promising approach to generate continuous feedback on learning progress and interaction in the exploration of learning assets.

The Office of University Didactics & E-Learning HdEL Bern [7] cites the degree of self-regulation and immediacy in combining asynchronous and synchronous learning units in a variety of ways: *"The learning process should be diverse and varied. Therefore, (a)synchronous learning scenarios and the degree of self-regulation should vary, be didactically taken*

into account and used in a targeted manner". And in a text in the book Educational Psychology it says:

"Self-regulation describes the ability to purposefully control one's own thoughts, emotions and actions. It is a basic prerequisite for setting and achieving goals. This applies to all areas of life; for sports as well as for professional life, for leisure time as well as for school and studies." [8]

Ryan, Richard and Deci, for example, write about the connection and interaction between motivation, self-regulation, social development and wellbeing [10]:

"Specifically, factors have been examined that enhance versus undermine intrinsic motivation, self-regulation, and well-being. The findings have led to the postulate of three innate psychological needs--competence, autonomy, and relatedness--which when satisfied yield enhanced self-motivation and mental health and when thwarted lead to diminished motivation and well-being."

III. PROCESS MODEL FOR SELF-DIRECTED LEARNING: MEDIALITY, COMPLEXITY AND MOTIVATION TO LEARN

The aim of our media didactic concept is to create varied and flexible learning settings in terms of information density and access (content complexity), interactivity/multimodality (mediality) and self-control. Agile learning scenarios are implemented according to a methodical process model as a loose network of semantically related learning resources of varying complexity, mediality and varying degree of self-control, which are prepared in a motivational sophisticated way and allow for directed exploration. Our target groups are Millennials and Generation Z, who are considered digital natives and actively use social media. Multimedia formats such as Spotify, Instagram, Snapchat or TikTok [11] enjoy sustained popularity and are part of everyday life. Our target group is *"digitally spoiled"* and demanding. Motivation is a basic prerequisite for long-term interest in specialist topics and self-directed learning. Sustainable learning success is only possible if the use of digital tools is also mentally appropriate.

A. Process model for learning assets

Our process model [12] is designed to combine the networking of lightweight learning formats (as uncomplicated access to new topics) and more complex formats enhanced by modality and interaction (in order to deepen knowledge) in a didactically meaningful way in terms of the target group and the learning goals to create an explorative, varied learning scenario. Through the agile combination of learning assets with different degrees of complexity we approach complexity reduction as an ambivalent topic.

The complexity for learning assets is derived from the three following dimensions:

- **Mediality** (interactivity, multimodality, design) degree of modality/mediality (text only, video only, video with audio, etc.) and interactivity (no interactivity, basic activity, branching up to being active/creative yourself)
- **Complexity** of content and subject (reduction of focus, information density), degree of complexity of

the content (basic knowledge, further resources, prerequisites required, ...)

- **Cognitive/psychological** dimension (self-control/motivation/wellbeing), degree of self-control (cognitive aspects, motivation, self-regulation, self-creation of content as the highest degree of self-control and often learning objective)

To start with, the focus is on the motivation of the students, who in the best case are *"triggered"* and become enthusiastic about, e.g., challenging, technical topics. We would like to pick up the students who are e.g., influenced by social media where they are. At the beginning, we focus on short attention spans and then, if there is interest, we deepen our knowledge.

Device-independent presentation and interaction according to the 24/7 paradigm and the *"mobile first"* approach (*"anytime, anywhere, anyplace learner"*) are basic requirements for the learning formats to be designed.

B. Four levels of complexity

In order to accommodate research into learning materials of varying degrees of complexity on IM topics, we propose a preliminary, agile categorization into four levels of complexity for learning materials to be created, which will be adapted and expanded step by step. The four levels of complexity are:

- A:** Social media compatible information for getting started, e.g., IM glossary at Instagram.
B: Multimedia learning assets for teaching basic knowledge e.g., educational films, screencasts with Camtasia [13] and Open Broadcaster Software (OBS) [14] lecture recordings, explanatory videos, podcasts, animations, lecture with audio.
C: A, B or other Open Educational Resources (OER) [15] with in-depth information and interaction (self-active and thinking along, exploration) e.g., via H5P [16], quizzes, tutorials, autonomous creation and publication of media content for the IM curriculum.
D: Branched learning offers (remix, exploration, self-active, thinking along, knowledge transfer) with personalized learning path (Branching Scenario) e.g., via H5P.

IV. DIGITAL FOCUSING AND REDUCTION: MINI LECTURES AND DIGITAL WELLBEING

The cornerstone of the project is a dynamic, agile media-didactic concept that is continuously updated. At the center of the media didactic considerations formulated therein are the aspects of digital focusing and reduction against the background of a constantly increasing flood of information.

Various studies have already shown that multitasking, and thus the attempt to process or edit a lot of information at the same time, has a negative effect on concentration and productivity [17]. In addition, several studies have shown the associated effects on the human perception of stress. For example, the research team around Professor Clifford Nass of Stanford University found in their publication *Cognitive Control in media multitaskers* in 2009 that trying to perform several tasks at the same time leads to mental impairment. In

addition to a constant state of stress, the ability to remember also suffers from multitasking [18][19].

A. Multitasking and overwhelming

However, due to the increasing amount of information on digital media, we experience more than ever a kind of permanent state of multitasking, for example when we open ten different browser windows with different information at the same time while working on the computer and checking our e-mails and WhatsApp messages. Psychology professor and computer scientist Gloria Mark of the University of California, Irvine, explains this in the film documentary *Always networked - When the brain is overwhelmed* [20]:

"People have been doing several things at once for a long time. They make phone calls, listen to the radio... but what has changed in the workplace is that digital media has given them access to more information faster than ever before. People suffer from burnout because they have to constantly focus on new tasks. It's a burden. So we know that multitasking and the interruptions it causes lead to stress and cognitive overload."

In general didactic terms, but also specifically for our QpLuS IM project, the consequence of these findings must be to counteract this development. Especially as a project within our study program Information Management at the University of Applied Sciences and Arts Hannover, a constructive and responsible handling of information must be the focus for students and learners. In order to cushion the problem of the negative effects of multitasking and the processing of too much information at the same time, the QpLuS IM project is developing a media-didactic approach that is concentrated around a formal focus and reduction to the essentials.

Within the QpLuS IM project, digital self-learning materials are produced according to this principle (e.g., mini-lectures). Formally clearly structured and tidy user interfaces are fundamental for the communication of central learning contents. The developed self-learning materials are intended to act as supporting and, especially on basic knowledge, focused supplements to the courses of the study programs Information Management and Information Management extra occupational.

B. The balancing act in dealing with information and complexity

It is crucial that students receive compact information snacks in a tidy digital learning environment, if possible in the sense of *"mobile first"*, considering the ubiquitous use of mobile devices. In the learning environments produced, a large amount of simultaneous information should definitely be avoided, so that stress and excessive demands on students are noticeably reduced. However, such a reduction of complexity is a very ambivalent construct. On the one hand, the method of this formal reduction and focusing seems to be the only way to stimulate today's generation of students to a deeper examination of the respective subject matter without excessive demands, and in such a way that they do so out of intrinsic motivation. The challenge here is to produce substantial learning material with digital, reduced means that makes students want more and is not too superficial. The content must therefore be prepared creatively and excitingly

despite the reduction. It is essential that a small amount of selected information is concentrated and prepared in as complex a way as possible so that learners begin to understand education as a multifaceted and reflective process. So-called branching scenarios, which can be generated in interactive learning videos with the free and web-based tool H5P [21], allow creative experimentation here. Ultimately, the aim must be to reduce the complexity in terms of information overload in order to keep the stress level of the learners low. On the other hand, this must not undermine the learning process of training multi-layered, complex thinking. On the contrary, the complexity of the information flood should be significantly reduced, but by concentrating on a small amount of information, individual topics can be deepened and complex thinking improved, especially with the help of our model of complexity levels. A positive learning experience and a productive learning process should be the result of such media didactics. The following chapter describes a practical example from our project that takes up these considerations.

V. INTERACTIVE VIDEO: HOW DO SEARCH ENGINES WORK?

In 2019, a professional interactive video was produced as part of the QpLuS IM project, which explains the basic functions and mechanisms of search engines [22].

The idea was to digitally and interactively process a complex topic as a film in such a way that the rough contexts and individual components of the search engines are also easier to understand for beginners through a formally and content-wise focused, reduced processing. The video is based on an analogue model, which was developed by our colleague Monika Maßmeyer and which has already been used several times in her courses in the Information Management study program.



Figure 1. Interactive video on how search engines work; exposition



Figure 2. Interactive video on how search engines work; medium long shot; Duplo figure represents hyperlink

A. Concept of an interactive learning video of complexity degree D

In the video the important elements of the search engine such as crawler, searcher and indexer are personified, i.e., they are "brought to life" by human actors. The web, i.e., the individual web pages and their structure, for example graphics, hyperlinks or "dead links" are represented with the help of Duplo stones.

The aim of the interactive video is to provide users with basic knowledge about how search engines work in a focused, reduced and creative way. With the implementation of a so-called branching scenario, however, the user is encouraged to think actively and can deepen his knowledge beyond that. The interactive video thus functions in the sense of our complexity level D.

With an aesthetically appealing video look, video effects (e.g., glitch) and a playful, humorous presentation as well as a compact length, the aim is to "encourage" learners to deal with the topic. An impression of these aesthetics is shown in Figure 1 and in Figure 2. What makes the video special, however, are the individual interactivities. In line with our media-didactic concept, these are as reduced and sparingly used as possible and, in addition, are easy for the user to understand. Thus, there are some interactivities that function as in-depth information pop-up windows. As soon as corresponding scenes are shown in the film, in which important basics of the search engine function are presented, these pop-up buttons appear with corresponding captions.

If, for example, the World Wide Web is visible in the form of Duplo stones at the beginning of the film, a pop-up button with the inscription "World Wide Web" appears automatically. The user of the video now has a few seconds to click on this pop-up button. If he clicks on it, a detailed info text appears; if he does not click on the button, it disappears again after a few seconds.

For a superficial understanding of the topic, passive reception of the video without interactivity is theoretically sufficient, but in order to obtain more detailed information about what is shown, the video consumer himself must become active and "interact". Thus, interactions are not an end in themselves, but should encourage active self-learning by the video users.

A special feature in our interactive video is the implementation of the branching scenario already mentioned.

Branching scenarios have been used repeatedly in the history of entertainment media and are part of non-linear storytelling. Norbert Braun writes the following in his dissertation on non-linear storytelling [23] :

"The non-linear story is constructed from different branches [...]. Fixed branching points are integrated into each branch of the non-linear story. At these points decisions are made which lead the participant of the story into a new branch of the story. For each branch there is a predefined dramaturgy, which the user lives through until the next decision point."

With H5P, however, there is now a provider that even explicitly offers a Open Source tool for branching scenarios. In addition, branching scenarios can be created manually within H5P's interactive video tool using the *Crossroads* feature. This is also the case in our interactive video on how search engines work.

The possibilities with branching scenarios within interactive learning videos to encourage learners to think actively, self-directed and above all explorative are manifold, but also depend on a video production that is as creative and innovative as possible. We wanted to meet these demands with our interactive learning video and the production was accordingly professional.

The branching scenario in our video confronts the video user with a decision-making question. In order to make the right decision, the learner must have been self-learning in the previous video and have read the interactive info pop-ups carefully, as shown in Figure 3.

If the video user or learner makes the wrong decision, a video sequence is played showing the consequences of the wrong decision.

In this way, the active video user is also more likely to be inspired to reflect on their own learning. To ensure this reflected self-learning, it is important for the video user or learner that the video and the interactions implemented in it are based on a consistent and thus comprehensible architecture and design.

In order to create an innovative and coherent interactive self-learning video, it makes sense to concentrate on the aspect of focus and reduction in order to guarantee a high-quality User Experience (UX). Michael Richter and Markus Flückiger write the following: [24]

"An essential task is to avoid unnecessary complexity, to reduce the functional range of a product to an ideal minimum for the user and thus to optimize the functionality of the product. The technical system should support the user optimally in the execution of his goals and is designed exactly for this purpose. This reduction to the essentials does not come automatically and the decision which functions to offer and which to leave out usually requires some work and coordination. However, the effort pays off in the realization at the latest".

Our interactive video on how search engines work is also based on a tidy and reduced User Experience design.

Thus a manageable number of interactions are implemented in the video with H5P. The learners should not be overwhelmed by a multitude of information and possibilities. Rather, the focused interactions and information

should be processed cognitively in a sustainable and concentrated manner.

With these parameters, the interactive video on the functioning of search engines thus fulfills the demand for the three dimensions mediality, complexity, as well as the cognitive and psychological dimension in the sense of our complexity level D.

The logistical, creative and technical complexity of the video makes it clear, that this is learning material of category D. Although this is not always a prerequisite for a complexity level of categorization D, a scenic video with many creative elements and different action sequences requires a certain amount of production time. In this case, the pre-production (brainstorming, idea sketch, storyboard, planning of logistics) took about one month, the filming took four days, five to eight hours each, and the post-production (video editing, sound post-processing, color grading and effects processing) another twenty days. This time should be planned for the production of a professional scenic learning video, especially if you are a small team and have other work to do on the side. Alternatively, this work can be outsourced to an external agency, but this would involve an enormous financial effort.

For the project QpLuS IM, learning formats of the complexity categorization D, such as the interactive video on the functioning of search engines, will be supplemented in future by further productions of the complexity category A, B and C. Thus, a social media glossary of the complexity categorization A is planned for the further course of the project. For this purpose, basic terms from the Information Management and Information Management extra occupational courses of study will be explained briefly and concisely in text and pictures, for example via Instagram Post.

However, our interactive video is to be understood as a prototype to show which media-didactic possibilities are feasible with such a video. A survey of the learning benefit of students through the video has therefore not yet taken place.

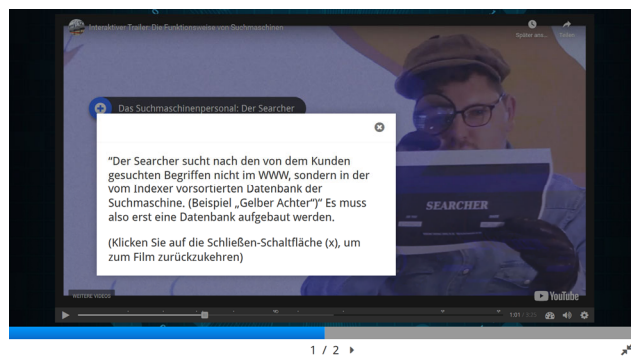


Figure 3. Interactive video on how search engines work; close-up *Searcher*; opened informational Text-Pop-Up-Window

B. Implementation of interactive branching element in detail

For the branching scenario in the interactive video on how search engines work, the H5P tool Interactive Video and the Crossroads feature it contains was used. With Crossroads, a branching pop-up menu can be integrated into the video that appears at the selected timecode position, as shown in Figure 4. In this pop-up menu you can now define various time codes

with text headings. If the user clicks on a timecode-defined heading, the video jumps to the corresponding timecode of the video. In this way, it is possible to jump to different action sequences in the video. When an action sequence ends, the branching menu reappears and the video user can again select how the video should continue.

In the case of the interactive video on how search engines work, there are two action options available.

Even though H5P is under constant development, there is still the limitation that the official Branching Scenario feature is still in beta and is not included in the Interactive Video feature. In the Interactive Video feature, the branching scenario must be created manually with the Crossroads tool. In this context, it would be welcome if H5P were to offer its users even more consistent and interlinked features in the future. There are also limitations in terms of aesthetics; for example, there are hardly any free design options for text overlays.



Figure 4. Interactive video on how search engines work; close-up *Searcher; Branching-Scena*

VI. CONCLUSION

Against the background of rapidly changing digital education, especially in times of the corona pandemic, in which self-directed learning is becoming increasingly important, the QpLuS IM project is concerned with the development of an agile, multidimensional process model in the sense of a media-didactic concept for the study courses Information Management and Information Management extra-occupational, which takes into account in particular the ambivalent handling of complexity.

In addition, a **four-level complexity model (A to D)** was developed, which is based on the parameters **mediality**, **complexity** and **cognitive and psychological dimensions**. This model can be used, for example, to efficiently determine learning goals and learning methods in the context of Constructive Alignment. The four levels are:

A: Social Media compatible information for the introduction.

B: Multimedia learning tools to impart basic knowledge.

C: A, B and further OER with in-depth information and interaction.

D: Branched learning offers with personalized learning path.

With the complexity level model, the digitally "*spoiled*" generations of learners and students are not cognitively overtaxed or stressed (in the sense of digital wellbeing), but

can acquire basic knowledge in a targeted and reduced self-determined way and, if necessary, deepen this knowledge.

There is already an interactive video about the functioning of search engines available for the courses of studies Information Management and Information Management extra-occupational, a self-learning resource of the complexity category D for practical use. With the planned further learning resources, such as the information snack glossary on basic terms of information management on Instagram, further complexity levels are to be served.

The aim is to create a modern, intuitive and consistent network of digital self-learning materials for the study programs Information Management and Information Management extra-occupational, which can be used in addition and integration to the official courses.

In order to achieve this goal, we want and need to do more research on the importance of self-directed learning, for example how the use of interactive tools like H5P affects the learning behavior of students.

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