



Digital learning communities as coherent learning-to-teach fields – development and evaluation of an innovative teacher training

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Abstract

Since 2020, professional learning communities have been established as part of the Qualitätsinitiative Lehrerbildung at Friedrich Schiller University Jena, in which digital learning concepts with a theory-practice connection are developed. The goal is to improve the cooperation between the accompanying teachers in the practical semester (mentors) and teachers at the university. From the perspective of subject education, current subject education topics are prepared as digital learning modules, for instance educational reconstruction, misconceptions, or language-sensitive teaching. Furthermore, this kind of professional teacher training aims to support university students' learning during their practical studies. The entire project includes pedagogical, psychological, and subject educational components. For chemistry learning, each module consists of a creative introduction, a screencast with all main contents, and an exercise phase. After that, all modules were piloted by teachers. The piloting was evaluated according to three criteria: exemplary evaluation of individual module modules by practice partners, use of a mixed-methods design (questionnaire and interviews), piloting of evaluation instruments. The developed questionnaire focuses on the areas: design of the modules, content satisfaction as well as benefits for the teachers. Moreover, wishes for further structural elements were surveyed. The interviews focused on the added value of the modules, the handling of the questionnaire and general hints, and the recommendations of the teachers. The article presents the development process, the results of the piloting, and further revision of the modules. Finally, recommendations for the main phase of the project will be discussed.

Keywords: *digital learning communities, teacher training, chemistry education*

1. Introduction

For many years, professional learning communities have been a central field of action in school practice as well as in educational research for successful school development [1]. At Friedrich-Schiller-University Jena, this model is being translated into a digital format as part of the Qualitätsinitiative Lehrerbildung (QLB), a Germany-wide program to improve teacher education. The aim is to improve cooperation between university lecturers and mentors at schools in order to strengthen the connection between theory and practice for students in practical semesters. This project, which is anchored in the framework of the QLB through the project DiLe (Digital Learning Communities for Coherent Learning Support in the Jena Model of Teacher Education) [2], represents an empirically accompanied practical approach for the current discussion about coherence in teacher education [3,4].

The project is divided into three modules: Module A focuses on the aspects of teacher's role understanding, communication, and coaching in connection with the specifics of the practical semester. Module B addresses the facets of heterogeneity and inclusion from a psychological perspective, and Module C comprises subject didactics, which in this project is represented by the subjects German, Social Studies and Chemistry. In form of digital learning modules, central education knowledge with which students enter their practical semester are presented for teachers, especially mentors of students. In this way, the transparency of teacher training between university and practical school curricula is to be increased. At the same time, the modules also serve as a further training measure for teachers.



2. Development of the digital learning modules in Chemistry

A digital learning-to-teach platform in Moodle was developed in the summer semester of 2020 as part of a subject didactic seminar. A total of seven modules was created. For this purpose, the topics *chemical models*, *preconcepts and misconceptions*, *technical language*, *educational reconstruction*, *inquiry-based learning*, *learning aids*, and *context-based learning* were developed together with students (Fig. 1).

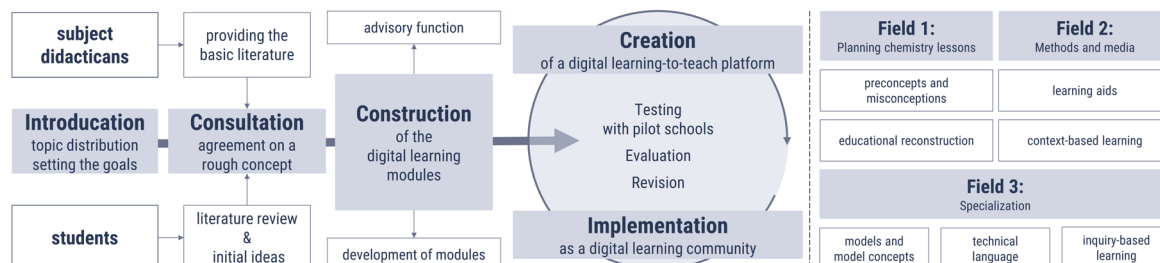


Fig. 1. Development process for creating the digital learning environment (left) and structure of the learning environment with the selected subject didactic topics (right).

The digital modules are based on the following design criteria:

Clear and uniform structuring of the modules

This includes an identical structure for all modules and orientation towards the triad of introduction, elaboration, and consolidation. The introduction serves as a creative motivation (e.g., through films, picture galleries, comics). The elaboration phase is designed as a half-hour screencast. In the last part, a pool of further literature and optional tasks is available, which opens up both reflections on one's own teaching activities and one's own possibilities for deepening them.

Diversity in design

In their function as a didactic role model, the modules are characterized by variations in the addressed social forms as well as by the use of different digital learning formats (films, learning platforms, digital collections, apps, etc.).

Focus on central didactical dimensions

The focus of each module lays less on concrete lesson planning but more on the presentation of the current subject didactic discussion. The processing time per module is 45 to 60 min. In addition, the modules, which represent in particular the elementary aspects of the topic, serve the cooperative processing of teachers with their internship students.

Subsequently, the developed modules were tested by five teachers. The piloting was accompanied by a mixed-methods design (questionnaire and interviews), which will be presented in the following.

3. Study design for the piloting phase

The questionnaire comprises the dimensions *interest* in, *structural design* of, *content-related design* of, and *evaluated benefit* of the learning modules. These were mapped by 4-level Likert scales and on the affective side by a semantic differential. In addition, selected structural elements were assessed on a grading scale. These include *introduction*, *elaboration* and *consolidation* within the processed module, the *quality of the videos* used, the *literature recommendation* as well as the *clarity* of the Moodle room. Furthermore, in semi-open formats, information was collected about *desired, further content-related focuses*, further *structural elements*, and *further collaborations*. In open formats, the participants were able to note *aspects that had been successful* and *those that needed improvement* as well as other *conspicuous features*. The interview guide consisted of the following questions:

- Did you have any difficulties in understanding the questionnaire?
- What added value do you see in the learning modules? What purpose do they serve?
- What would you have done completely differently? What would you have done the same way?
- What recommendations do you have for us for the main phase in the coming school year?
- For what other purposes could you imagine a similar approach? What would this look like from your perspective?
- What kind of support needs do you or your colleagues have with regard to digitization?



4. Key results

The semantic differential (Fig. 2) shows a fundamental interest regarding the processing of the learning fields. The assessment, as rather unimaginative, is striking. It could be assumed that this goes hand in hand with the school-like but naturally less creative structure of the learning modules (introduction - elaboration - consolidation). Regarding the design, it can be deduced that the teachers consider it to be varied, well-structured, and diverse. The contents are considered to be of high importance, and the learning modules to be close to the school and appropriate. The scales design, content and benefit support these results (Fig. 2). The question about the possibility to deepen the knowledge independently (item 3, scale design) provides a rather differentiated view. Here it should be questioned to what extent the project takes sufficient account of the individual teachers' needs. The evaluation of the associated structural elements also shows good to very good ratings. The rating of 2.5 for the elaboration indicates the greatest potential for revision; these are 30-minute recorded presentations as videos, which do not contain any interaction options either. Content-specific feedback on learning modules from the interviews provide the basis for this. Positive feedback from the open formats also underscores the appropriateness of the learning fields developed. In addition, there is a particular desire to engage with students as well as with teachers from their own and other schools. In addition to working with the digital learning modules, this is to be realized primarily through working groups. Ultimately, the teachers would also like to see a focus on individual needs in the content of the open formats.

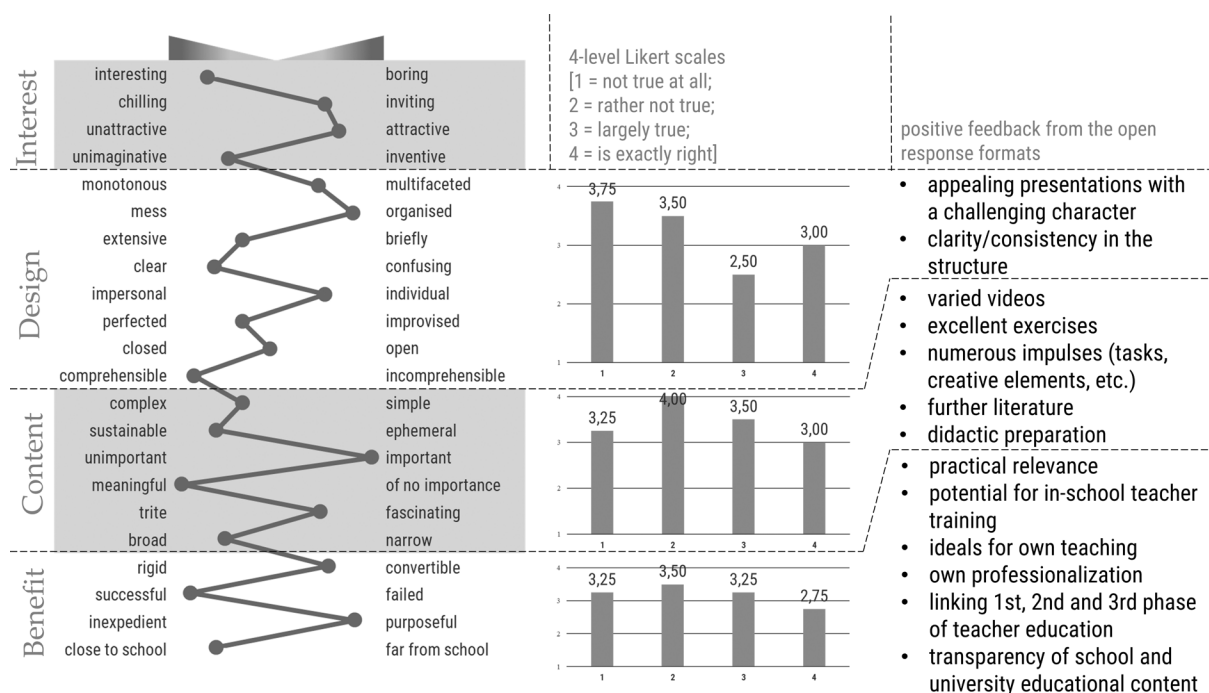


Fig. 2. Selected results of the questionnaire survey.

[Items Design: The structure of the modules makes sense. (1), There is a common thread within the modules. (2), The modules offer sufficient opportunities for individual study. (3), The quality of the media used (ppt, video, animations etc.) is very good. (4); Items Content: The presentation of the content is appropriate to the subject. (1), The modules cover central didactical dimensions. (2), The content of the modules is relevant for teaching. (3), The modules give a good overview of the subject didactic education at the university. (4); Items Benefit: The modules can help me to improve supervisions of internship students. (1), The modules can be worked on together with colleagues or internship students. (2), The modules can serve my own further training as a teacher. (3), I have learned many new aspects of the content. (4)]

The interviews were analyzed using qualitative content analysis according to Mayring [5]. The added value of the modules is assessed by the teachers and coincides with the aims and objectives of the project: both the improved cooperation between school and university and learning in a learning community were identified as purposes of the project. In addition, the requirement for one's own professionalization represents the idea of teacher trainings with regard to current dimensions of educational science and subject didactics. The interviews also underline the appropriateness of the previous development work. It is apparent that teachers would like to see additional interactive,



collaborative formats that are geared to individual needs. Accordingly, the developments to date must be supplemented with aspects of collaborative working and learning.

Tab. 1. Derived category system from the interview survey (selection).

estimated added value of the learning modules		
Theory-practice linkage	own professionalization	learning community
1 improved communication	3 subject education training	5 exchange with colleagues
2 transparency in training	4 ideas for one's own teaching	6 development of blended-learning-formats
worth preserving (*) and potential for change (**)		
learning community		modules
1 consideration of individual needs **		7 structure of the modules *
2 integration of interactive and practice phases **		8 variance in learning accesses *
3 integration of collaborative work phases **		9 focus in the elementary *
4 arrangement of work phases in the center **		10 providing solutions to exercises *
project design		
5 online evaluation *		11 complete the modules by a transfer, linking the introduction and conclusion **
6 presentation of cross references between the modules **		

5. Outlook for the main phase

The evaluation results confirm the digital modules as appropriate. In addition to module-specific revisions, which particularly include interactions in the learning fields, the character of a learning community is sharpened for the main phase. This is reflected in the teachers' demands for greater collaboration with other stakeholders. The desire for their own professionalization and the consideration of individual topics also express a type of a teacher training, through which teachers hope to gain both subject, subject education and educational knowledge as well as cooperative and learning activities in communities with regard to the teacher training formats. For the main phase, which began in November 2021, the learning fields will therefore form the basis of the content, so that the individual teachers' needs can then be jointly addressed in a learning workshop. In addition, the potential for networking with the 2nd phase of teacher training will be explored by offering the modules to trainee teachers and discussing them together with teachers.

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