Research-Based Learning in Digital Teams

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Abstract

The developmental research project presented in this paper pursues the goal of enabling students to learn basic research methodology in digital teams and eventually to become active in research themselves. For this purpose, we will implement the concept of Research-Based Learning in digital teams using a peer-review-based AI-online tool. We resort to a software that was recently developed in a joint project involving three German universities funded by the Federal Ministry of Education and Research (BMBF) and which we would like to implement in an educational module for the first time. We work closely together with the developers of the software and connect conceptually to the current scientific discourse.

Keywords: *artificial intelligence, research-based learning, knowledge creation*

1 Introduction

The competence to create new knowledge is vital for both researchers and academic staff members within the university. This academic key qualification will continue to gain importance in other domains in the context of shorter innovation cycles, digital transformation and agile, self-directed forms of work. Hence, introducing students to scientific work is an essential task of post-secondary teaching. However, due to large numbers of participants and limited resources, many university teachers have resorted to a mixture of classic lectures, teamwork on individual topics during course hours and examinations in the form of individual written papers on individual aspects of scientific work. These conditions are prevailing in many universities and they give rise to three challenges, which we would like to address in the context of a developmental project:

- suboptimal teaching formats and insufficient feedback to students due to high numbers of participants
- educational potential of a change of perspective between the role of researcher and reviewer remains unused
- self-organized or random formation of teams are not optimal for the learning process

The challenges presented here in short do not only arise within the framework of our module, but are typical of all events in which students are to learn scientific work.

2 Objectives

We aim at fostering exploratory learning in digital teams and consequently at guiding participants during the initial study phase of their subject area. Three objectives are to be realised as follows:

2.1 Implementation of Research-Based Learning on the basis of peer-review procedures within an introductory module in the field of Economics

We build our educational development upon a heuristic model for teachers who want to take on the concept of Research-Based Learning in their teaching. This model has been developed within the framework of a project involving three German universities funded by the Federal Ministry of Education and Research (BMBF) [1].

Based on the work of Brew [2], the so-called “FideS dual-wheel model” identifies factors teachers need to consider when developing a research-based learning module. It implies that teachers’ decisions should be based on learning outcomes combined with pedagogical, institutional, research- and disciplinary perspectives: Brew’s model integrates

> decisions about the curriculum context including the nature, number and type of students, learning outcomes including disciplinary knowledge acquisition and attributes capabilities and skills to be developed as well as the nature of knowledge

and the nature of the tasks to be completed and how they are to be assessed [2, p. 613].

The FideS model builds upon this approach. It emphasises the extent of student autonomy in developing research capability [1, p. 128]. As shown in Fig. 1, the FideS-authors distinguish between a micro and a meso level. At the micro level, an extent of autonomy is chosen for each aspect of the Research-Based Learning methodology (e.g. research topic, research question, planning, implementation, presentation of results, reflection, and feedback). The meso-level reflects the teaching staff's leeway as defined by the programme curriculum (curricular integration, number of credit points, modular responsibility, resource framework, time frame, and examination framework). The double-wheel model illustrates that decisions at one level affect the other and facilitate or restrict options for educational decisions [1].

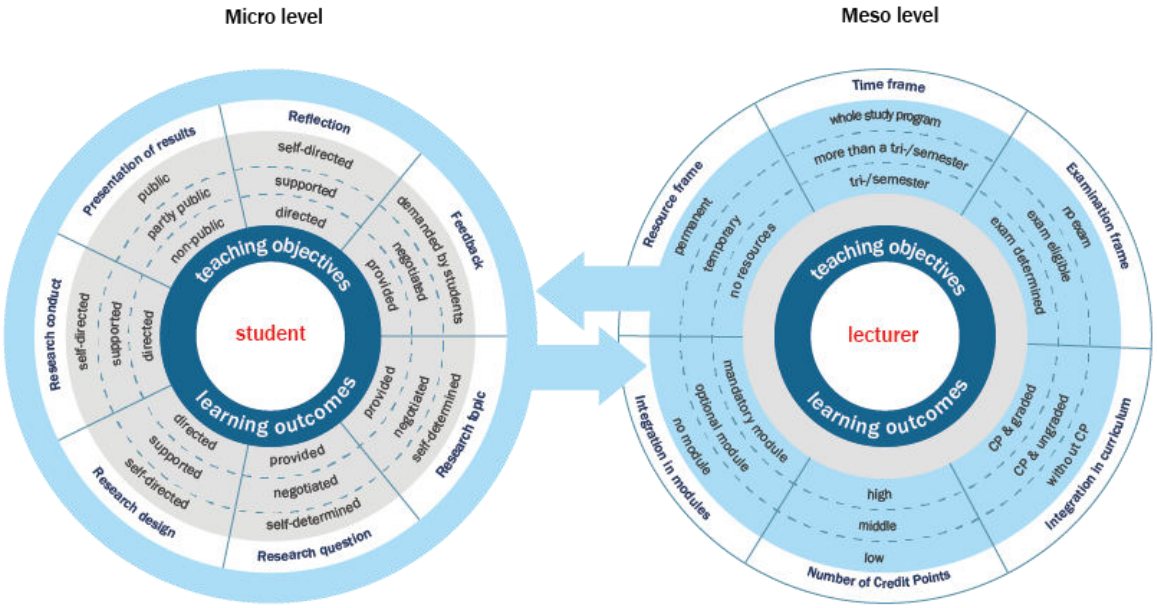

Fig. 1: Analysis and conception of research-based learning – the FideS dual wheel model by [1][1]

On the basis of this heuristic model, we will further develop an introductory module on research and scientific writing in the field of economics: We address a compulsory module with 6 ECTS points and an average of 70 participants, which is part of a Bachelor's degree course in Business Administration in the Department of Business Administration and Economics at OWL University. Our redesign aims to enable students to learn by conducting typical parts of economic research: For this purpose, two major adaptations have to be carried out:

- Students should work in teams rather than individually to prepare an extended abstract for a research project within the framework of the module.
- The degrees of freedom are to be defined, e.g. with regard to the choice of topic and the research methodology.

Reflection and feedback processes are crucial in Research-Based Learning. We use peer assessments to guide students towards reflective learning [3, 4]. Students take on the role of critically reviewing the work of their fellow students and giving each other feedback Students should support each other while planning and implementing their research projects. To this end, we will establish mutual reflection exercises and feedbacks. Evaluation criteria for economic research and scientific writing will be edited for learning and peer review purposes.
Peer reviews are expected to improve learning outcomes in three ways. First, they complement feedback provided by the lecturer and thereby enrich learning for the recipient. Secondly, peer reviews are expected to help the reviewers with regard to their own research projects. By switching the perspec-

[1] Retrieved from http://forschendeslernen.com/fides/indexeng.html

tive from author to reviewer, students gain a more profound understanding of scientific writing. Finally, peer reviews promote exchange, cooperation and networking among the students – they form a "community of practice" [5, p. 652 f.]. Ideally, grading is partially based on peer reviews (provided the examination law allows for this).

2.2 Implementation and testing of an innovative software tool with peer-review functionality to support exploratory learning in digital teams

Digital technologies have the potential to promote self-organised and cooperative learning. In portfolio and content management systems, reusable learning materials like *wikis*, *blogs*, *podcasts* or *video portals* can be made available for receptive learning. Furthermore, digital learning environments can promote reflexive learning [6]. Thus, the implementation and coordination of peer assessments is considerably simplified due to the digital availability of learning outcomes. Furthermore, digital platforms facilitate collaborative work on joint projects and asynchronous communication in teams [7]. Yet, tools for digital peer reviews are rarely implemented in learning platforms.
Supporting software for Research-Based Learning has already been developed by the FideS team (see section 2.1). The software addresses three challenges that teachers face in Research-Based Learning: 1) to give or to organize feedback on research questions/problems, 2) to form more productive student teams based on individual research and learning interests, and 3) (peer) reviewing the joint results. We seek to implement this tool to facilitate teamwork and peer reviews in large-scale learning environments.

2.3 Establishment of an online pool of teaching materials for scientific work

We will support our students throughout the research process by providing learning materials for scientific work. Complementary, students will be provided with informative and inspiring contributions in the form of wikis, blogs, podcasts and videos on a collaborative OER platform (Open Educational Resources). Primarily, we will re-use media already produced here (e.g. tutorials on literature management issues, podcasts on how to find a suitable research topic, or TedTalks on an appealing presentation of results). All media will be embedded in the module plan (with guiding questions, explanations, cross-references or assessments) so that students can use these items for online-supported self-study. In addition, subject-specific examples [8] will be prepared – i.e. outstanding or particularly vivid examples of good economic research or good reviews. Students can use these examples for inspiration and they will provide orientation in the context of learning through research.

3 Measures of Success and Transfer Opportunities

We will consider this project successful if we succeed in

- developing a sound educational concept together with a detailed plan for the implementation of Research-Based Learning using the FideS software in the Department of Business Administration and Economics at OWL University
- carrying out a pilot course until summer term 2022, evaluate it and prepare it for the winter term 2022/23 in such a way that it can be consolidated and transferred to other teaching areas.

Our module could serve as a case study for other compulsory subjects in a wide range of disciplines. Since the research process is similar in most social science disciplines, the concept of learning by doing research in digital teams can be applied to many degree programs. The FideS research team deliberately pursues the goal of developing a tool that can be applied across disciplines. Their open source software will be freely available via GitHub (https://github.com/) and can thus potentially be used by all universities for the implementation of software-supported Research-Based Learning. We will make our online pool of learning materials for scientific work (wikis, blogs, podcasts, videos etc.) also freely available as a collection of Open Educational Resources (OER). University lecturers and students from all disciplines cannot only use this offer freely, but also add additional content.

4 Risks and Limitations

One major risk is the introduction of Learning through Research as an educational approach that is new to the subject area. For both teachers and students this means a change in their previous teaching and learning habits. We therefore plan to actively collect feedback from students and teachers both before the introduction and during the pilot semester within the framework of Teaching Analysis Polls (TAP). Besides, we will involve them in the educational development process. Finally, the sum-

mative evaluation of the course carried out towards the end of the pilot semester offers the opportunity to compare the overall result with the results of previous runs of the course.
A further risk of this project is the comparatively high technical requirements for implementing the FideS tool in the IT infrastructure of OWL University. In order to minimize the risks associated with the technical integration, the adaptation and use of the software will be carried out in close cooperation with the FideS project team and especially with the software developers.

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