

## **Training of Change Agents for Engineering Education: A Concept for Improving Teaching and Learning of Students**

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## **INTRODUCTION**

As one of the biggest technical universities in Germany, the Berlin Institute of Technology (TU Berlin) is accommodating more than 30 000 students. High numbers of first-year students in introductory lectures make teaching and learning often ineffective and unsatisfying, also with respect to success rates in exams. It is important to know that high numbers do not mean 50, but up to 1000 students or more per lecture.

Therefore, crucial questions are: How can interactive learning in this environment be fostered and successfully implemented by a study reform? Which competences do the change agents need? How can they be developed?

The full paper describes and analyses the change agents' role in the qualification process for their own teaching in higher education and how they prepare and improve to act as consultants to their teaching colleagues. We illustrate how they perform in their disseminating tasks. An exemplary curriculum draft for the qualification of such a change agent profile will be outlined.

## 1 GENERAL CONSIDERATIONS

### 1.1 Organisational and staff development

The implementation of the necessary change requires staff development as well as organisational development. For staff development, we train research and teaching assistants who are supposed to spread good practices in teaching methods to their fellow teaching staff. Teaching staff at TU Berlin, in addition to about 300 full-time professors, comprises nearly 2500 teaching assistants in 7 faculties, normally contracted for 3 to 5 years. Besides working on a doctoral thesis, they are obliged to teach at least 4 hours per week. For organisational and curricular development, our solutions are to launch innovative teaching formats and to improve the quality of learning for the students by the management of innovative teaching projects.

In this contribution, we focus on additionally employed teaching assistants contracted to function as a kind of “change agents” (resp. “disseminators” or “key communicator network”) for the study reform within their faculties and departments. These change agents are not only responsible for the management of certain innovative teaching projects. They also involve other teaching staff in continuing qualification for teaching in higher education and spread good teaching methods to their colleagues.

They are the key success factors of our project ***tu wimi plus***. This is one among eight projects at TU Berlin – currently funded by the German Federal Ministry of Education and Research – to provide better study conditions and to improve the quality of teaching and learning [1].



Fig. 1. Measures of the Programme [2]

### 1.2 Goals and content

Goals of the project are

- a better student-to-teacher-ratio,
- a quality enhancement in teaching,
- the development of innovative teaching curricula.

How can these goals be reached successfully? In order to provide a better student-to-teacher-ratio in selected challenging areas of our university, additional research and teaching assistants with contracts limited in time are employed in the project ***tu wimi plus***.

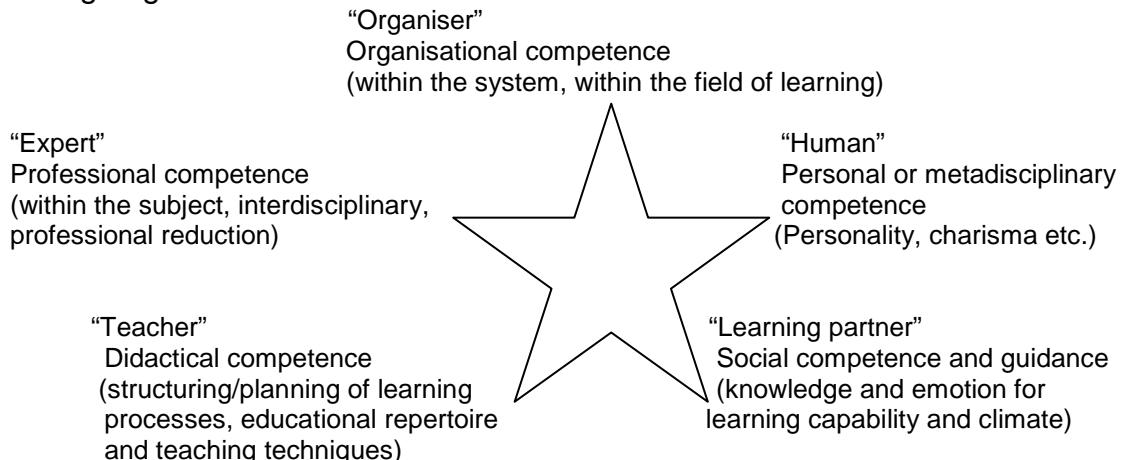
For the change agents, we have implemented an approach on two levels. Firstly, training for teaching in higher education and professional counselling is offered to them to ensure quality enhancement in teaching. Based on their improved teaching competences and their acquired didactic knowledge, they will act as disseminators within their faculties and departments. The long-term task is that they provide counselling and workshops about best practices in their fields to their teaching colleagues. Secondly, within the project the change agents also develop innovative teaching curricula which they apply directly in their own subject-specific teaching.

Thus, they close the gap between staff and organizational development and make them work hand in hand.

The content of the training for our change agents is based on the existing certified programme “teaching and learning” as well as on tailor-made offers according to their individual needs (see 3.).

### 1.3 Competences and tasks

The general question in order to develop innovative teaching curricula is: What kind of qualification is needed to teach interactive learning in this environment and to promote a study reform? Describing the types of competences, innovative teaching change agents could be...

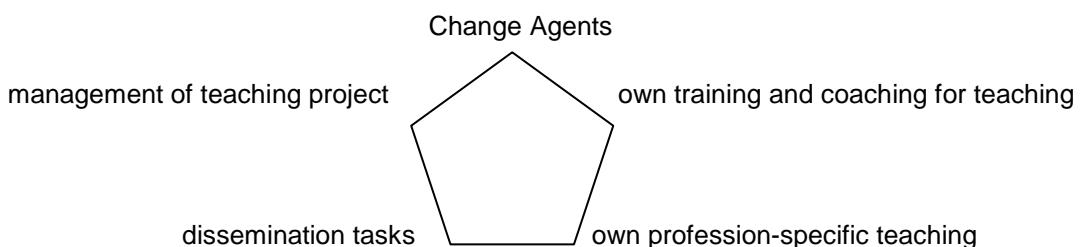


*Fig. 2. Competences for (teaching) change agents [3]*

By means of a Delphi survey of German-speaking experts for teaching in higher education, a demand-oriented, sustainable model of didactical competences for teaching in higher education has been developed. For teachings, the following ranking of 10 most important competences has been compiled: knowledge of (didactic) methods, professional knowledge, supporting independence, self reflection, enthusiasm, competence orientation, communication skills, participant orientation, conception competence, use of methods/change of perspectives. The model also describes competences for processing examinations and academic self-administration [4].

## 2 THE CHANGE AGENTS’ ROLE IN THE QUALIFICATION PROCESS

In the following step, we describe and analyse the qualification process for their own teaching in higher education and how they prepare and improve to act as disseminators to their teaching colleagues. Also, we picture how they perform for their own teaching in higher education and in their disseminating tasks.



*Fig. 3. Roles of (teaching) change agents*

## **2.1 Training: teaching in higher education and professional counselling**

Comprehensive counselling and supervision for the development of professional competences are ensured by the following offers:

- Workshops for disseminators
- Single and group coaching
- Regular topical meetings including subject-specific teaching
- Lecture series on teaching in higher education

Examples of tailor-made offers are:

- Team-building kick off-event
- Training and coaching for disseminators on teaching in higher education
- Workshop on counselling competences
- Offers of subject-specific didactic, e.g. for mathematics of laboratories

For knowledge sharing and self-study, an interactive forum about teaching in higher education is currently established on a moodle-platform [5].

## **2.2 Project: development of innovative teaching curricula**

The change agents also attend a training module for project management skills and didactic conception of curricula for teaching projects. Examples for teaching projects are described in the conference submission of Nikol [6].

## **2.3 Disseminating: good teaching practice for colleagues**

The demands of the change agents working profile also include that they perform (didactical) dissemination trainings for their teaching colleagues at least twice each year. The most frequent example is mini teaching staff conferences.

Other dissemination activities are [7]

- among teaching peers: information on available didactic literature and possibilities of didactic continuing education; presentation of selected contents of didactic continuing education modules; workshops on problem-based learning with discussions on its implementation into different subjects of studies; presentation of recent didactical trends in different subjects of study; continuous reciprocal peer observation of teaching; consultation for face-to-face-teaching and use of digital media; weekly question-and-answer session on teaching and implementation of innovative teaching elements.
- preparation of the whole team for examinations: generation of new tasks and questions; development of a standardised grading scheme for written exams; proposal of a common grading scheme for the whole department (with a revision of the former one together with all institutes).
- within the project: project meetings or weekly status of teaching project progress; didactical training and guidance of student tutors for their teaching tutorials and laboratory work including preparation/improvement of slides and blackboard use; weekly preparatory coaching and observation of teaching; discussions on necessary documentation of teaching activities and handing over the baton/job training for new teaching staff; knowledge transfer management.

### **3 THE CURRICULUM FOR THE CHANGE AGENTS' DEVELOPMENT**

The qualification is ensured by the participation in modules from the existing accredited programme "teaching and learning" as well as by attending tailor-made and newly devised course offers according to individual or special needs. An exemplary curriculum draft for the qualification of such a change agent profile is outlined in this section.

#### **3.1 The existing accredited programme "teaching and learning"**

The concept of our Introductory Course "Teaching for University's Best" is a training course accompanying the teaching assistants' first semester of teaching experience [8].

The basic and specialisation courses we are offering within our accredited programme for teaching in higher education are listed along the lines of general aspects of teaching, activating teaching and teacher-oriented methods as well as examinations and evaluation issues.

Mainly the structuring along the lines "activating teaching methods" and "teacher-oriented methods" allows it to organise the course issues methodically and with regards to contents according to practical teaching settings in projects and lectures.

##### **General teaching methods and basic concepts**

- Planning and designing teaching and learning processes
- Basics of how students learn
- Resolving difficulties to ensure successful teaching
- Gender in teaching and learning
- Intercultural communication in teaching and learning
- Learning techniques and organisation of scientific work
- Workshop: Teaching portfolio – concept and teaching philosophy

##### **Activating teaching methods:**

- Project work and project-organised learning in higher education  
(The concept is published [8]).
- Working with problem-based learning - management of the learning process
- Moderation in teaching and learning
- Workshop: Enhancing key competences by games
- Communication and group dynamics for teaching staff

##### **Teacher-oriented methods:**

- Promotion of learning in lectures and large groups
- Planning a presentation or lecture for an English-speaking audience
- Presentation techniques

##### **Teaching media:**

Goal is to acquire competences for the integration of classical and digital media elements in teaching concepts.

- Traditional media in teaching and learning
- New media in teaching for beginners

The blended learning-course consists of: Introduction to e-teaching, online-communication and teletutoring, media didactical concepts, copyright questions at universities, e-tools for mediaproductions, report and presentation of their own e-teaching projects.

### Examinations and Evaluation

- Competence-oriented assessment, grading and examination
- Evaluation of teaching in higher education

Attending an additional lecture series on teaching in higher education allows short-term and easy access to methods and information. Themes are among others: Best practice examples of teaching at TU Berlin, professional lecturing, problem-based and project-oriented learning, competence-oriented examinations, managing learner diversity.

These courses are also open for other teaching staff of our university. Goal is to establish interdisciplinary networks and exchange of experiences. The participants are consulted when choosing and combining courses according to their individual needs and teaching profiles.

### **3.2 Tailor-made offers according to their individual needs**

The tailor-made courses have been planned according to project-related requirements and participants' needs, in particular cases or for each individual case as permanent offers or single events.

*Table 1.* Tailor-made offers for (teaching) change agents

Permanent offers	Project-related requirements	Participants' individual needs
Coaching	Kick-off workshop for project members  Planning workshop (for teaching projects)	Workshop: grading scheme for final written exams
Jour Fixe for project members	Disseminators' training with focus on the development of a workshop concept	New media, e.g. digital voting, use of interactive teaching technology
Network of professors in the project	Reporting workshop  Writing workshop for advertising of innovative teaching formats  Knowledge management: handing over the baton  Networking for teaching staff	Professionally acting in the lecture hall  Convincing presentations: rhetoric in scientific teaching  Todays students' characteristics

### **3.3 Exemplary curriculum draft for the qualification of such a change agent profile**

The following table shows the draft of the recent curriculum we have offered to the first group of change agents. It has been developed in cooperation with the participants' needs and the trainers' teaching purposes.

*Table 2.* Curriculum for (teaching) change agents

Time	Programme Teaching and Learning	Tailor-Made Offers	Supporting Programme
1 semester	Introductory course	Kick-Off workshop	Coaching Peer observation of teaching

			Project jour fixe (implementation, continued in the following semesters)
2 semester	Activating teaching methods, project work and problem-based learning	Planning workshop for teaching projects	Workshop for reports
	Imparting knowledge & presentation techniques in lectures	Development of a dissemination workshop	Workshop for writing: attractive advertising
	Classical and digital media in the teaching process	Digital media: participatory tools	Online forum for exchange of experiences and self study
	Assessment and grading	Workshop: grading papers and tests	Lectures on examination techniques
3 semester	Moderation of learning groups	Workshop: reflecting dissemination work	The student generation today: their goals and possibilities
	Managing difficult learning situations		Lecture on learners' diversity
	Research based teaching and learning	Evaluation of lectures: development of an activity-oriented questionnaire	
4 semester	Development of key competences	Half-time conference: Interim results of teaching projects and dissemination activities	Knowledge management workshop: handing over the baton
	Studying Technique and Work organisation	Planning of future strategies	Workshop: networking for lecturers

Semester 1 has started with the introductory course for teaching activities and the kick-off workshop for the project members. At the same time, the permanent supporting events like coaching, peer observation of teaching and project jour fixe have been implemented.

Semester 2 concentrated on the two big lines of teaching: activating teaching methods, project work and problem-based learning as well as imparting knowledge and presentation techniques in lectures and large classes. The basic aspects and methods of the teaching projects of the change agents and their disseminating tasks have been planned and prepared. This has been framed by techniques for the use of classical and digital media as well as the application of assessment and grading. The consolidation has been reached by tailor-made individual offers. According to project guidelines, the first report and material for promotion have been developed.

Semester 3 is setting the focus on moderation and difficult situations in learning groups as well as students' characteristics. The link between research and teaching is addressed. An evaluation questionnaire for a pilot study is developed within the project.

During Semester 4 in 2014, networking and handing over the baton will be initiated. Preparations for the implementation and prolongation of the project will start. This and planning the future strategies will be main topic of the half-time conference for all project members.

## 4 CONCLUSIONS AND OUTLOOK

We assume with this strategy for a study reform that organisational development is influenced by staff development and innovative curricular specifications. Our change agents are prepared to fulfil tasks of innovative teaching: their own teaching projects and their dissemination function to their teaching colleagues.

Quality is assured by evaluation of all didactic measures: lectures, projects, workshops and coaching. The change agents can acquire a certificate for their active participation in all these continuing education courses.

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