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Research-based teaching and learning (RBTL) – a paradigm for enhancing teaching and learning at research universities

Enseñanza y aprendizaje basado en la investigación (RBTL) - un paradigma para mejorar la enseñanza y el aprendizaje en las universidades de investigación

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Abstract

Although universities are established seats of research and teaching (teaching-research-nexus), the two fields often remain separate, with students cut off from current research. Yet, to develop a critical approach to academic issues and research, it is essential for students to be exposed to current research.

The text explores an "research-based teaching and learning" (RBTL) training model currently being developed by the University of Zurich, a leading research-oriented university, which is designed to draw on the research skills and experience of its academic staff in encouraging them to integrate current research into their teaching. In this learner-centered model, the aim is for university students to learn about the research process and develop their own research skills. Recent research will be briefly reviewed.

Keywords: Research-based teaching and learning, scholarship of teaching, research- teaching nexus.

Resumen

Si bien las universidades son espacios consolidados de investigación y docencia (de relación entre enseñanza-investigación), los dos campos a menudo se mantienen separados, manteniendo a los estudiantes separados de la investigación en curso. Sin embargo, para desarrollar en los estudiantes una aproximación crítica a las cuestiones académicas y de investigación, es esencial para que sean expuestos a la investigación que se esté llevando a cabo.

El texto explora un modelo de formación docente en enseñanza y aprendizaje focalizado en la investigación (RBTL) actualmente desarrollado por la Universidad de Zurich, una universidad fuertemente orientada hacia la investigación. Dicho modelo, diseñado para aprovechar las habilidades de investigación y experiencia de su personal académico, trata de animarles a integrar la investigación realizada en su enseñanza. En este modelo, centrado en el alumno, el objetivo es que los estudiantes

universitarios aprendan acerca del proceso de investigación y a desarrollar sus propias habilidades de investigación. El artículo revisa el trabajo recientemente realizado.

Palabras clave: enseñanza basada en la investigación y el aprendizaje, profesionalización docente, relación entre investigación y docencia.

Context and framework

In Europe the Bologna reform has triggered an intense debate on the nature of teaching in higher education, as the "shift from teaching to learning" has brought about a radical reappraisal of university teaching that moves away from the notion of merely imparting knowledge.

As a result of this debate, universities in the German-speaking world have launched a range of training courses for their teaching staff, yet many of these have not been integrated into a systematic academic staff development program (Brendel/Kiehne, 2011). These developments thus continue to contribute to the overall lack of an effective interface between research and teaching.

The University of Zurich (UZH), a research-intensive and internationally renowned university with an excellent research profile, is home to more than 12 Nobel laureates. As a research-intensive university, it is a member of the League of European Research Universities (LERU). With 25,732 students in 2012, it accounts for approximately twenty percent of the whole student population in Switzerland.

The University has set itself the aim of supporting the links between research and teaching at all levels by means of research-based teaching in order to enable students "to participate actively and independently in research processes or to plan, implement and present the results of research projects" (UZH 2020 Strategic goals). As part of this venture, the University of Zurich has taken measures to systematically strengthen the links between teaching and research with the future aim of expanding support measures for university teachers and raising the profile of existing good practice. As yet, however, even at the University of Zurich, there is no training program that offers systematic support to those teachers who wish to actively integrate research-based teaching into their own teaching.

Good starting points for the development of research-centered teaching at the UZH are offered by the wide range of concepts of "research-based teaching" discussed in the research literature and by the insights gained in the English-speaking world from the implementation and application of these concepts (Jenkins/Healey, 2006).

In the following pages we will describe how these concepts of research-based teaching are understood at an international level and how the University of Zurich in particular interprets them, and we will introduce a model of teacher training that the University has developed from there.

The nexus between teaching and research: international concepts

The international debate on the interface between research and teaching has been conducted under a variety of banners and concepts (such as "research-based", "research-led", "inquiry-based", "research-informed" teaching etc.). This broad variety of terminology reflects the intense debate and ongoing developments of the last thirty years (Jenkins/Healey 2006; Kossek 2009; Tremp/Hildbrand 2012).

The following concepts play a key role in the international debate: "the teaching-research nexus", "research-based teaching and learning" (RBTL), and the "scholarship of teaching and learning" (SoLT), inspired to a large part by Boyer's (1990) book *Scholarship Reconsidered*.

The research-teaching nexus – the interface between research and teaching – can be incorporated into curricula and courses in a variety of ways. Healey (2006) proposes that a distinction has to be made between two dimensions: one dimension differentiates between whether the focus of research-based learning is on research outcomes or on the research process, whereas the second dimension distinguishes between the roles that teachers and students play in this process. In the latter, the spectrum ranges from formats in which students actively participate in a research process to teacher-centered forms, in which students take on the role of an audience to whom knowledge is presented.

Teacher-centered forms may concentrate on current research outcomes (research-led) or introduce students to research methods and approaches (research-oriented). In student-centered forms, in which students write and discuss academic texts (research-tutored), research results are the principal focus. In inquiry-based and problem-based learning, the main emphasis is on the students' own research activities. Learners experience all stages of the research process themselves, from devising a research question to presenting research results.

At American universities the concept of "research-based teaching and learning" (RBTL) has become widely widespread, especially in the wake of the recommendations made by the Boyer Commission (1998). RBTL focuses on introducing students to the skills required to conduct their own research activities. Students are not only given an insight into current research but are also taught to understand research processes and to initiate them themselves. Thus RBTL focuses on three main goals for students: first, a deeper knowledge of a subject through an independent search of research literature and engagement with their own research question; second, the acquisition of research skills, meaning that students are able to go through the research cycle and to use research methods; and third, the development of an attitude as a researcher, meaning that students learn to accept the insecurity of the research process (Hellmer 2009, p. 214ff).

To counter the difficulty of overburdening students with excessively complex material at the beginning of their studies, it is possible to reduce the complexity of the subject matter either by focusing on individual phases of the research process or by devising a suitably narrow research question (Tremp/Hildbrand 2012).

This approach is intended to begin at Bachelor level and continue throughout all levels of academic training. Successful undergraduate programs in the USA are a good example of how students can be involved in research activities from the very beginning of their studies (Jenkins/Healey 2006, p. 37).

In SoLT approaches (Huber 2011) the primary focus is placed on instructors using their own teaching as the object of research, thus developing their own teaching through research and reflection.

The understanding of RBTL in the University of Zurich

RBTL is intended to support the systematic integration of teaching and research at all levels, from individual courses through the development of study program curricula to the university as a whole.

The University of Zurich sees and uses the concepts of the "systematic integration of research, teaching and learning" and "research-based teaching and learning" (RBTL) not in a narrow sense but as broadly synonymous.

Following Healey's (2005) taxonomy, all forms of research-led teaching should be supported in order to meet the needs of different disciplines, teaching formats and the varied didactic approaches of teaching staff. The UZH is home to about 100 disciplines, offering more than 150 study programs. As a result, several characteristic forms of RBTL have been developed and implemented in the different disciplines, based on the wide range of research methods in the particular fields. Using a broad understanding of RBTL, the UZH hopes to meet the requirements of the different subjects.

Strategies for implementing RBTL

Jenkins and Healey (2006) have shown that research has been conducted on the strategies that universities use to support research and also on strategies to implement student-oriented teaching, but that little work has been carried out on how to systematically support the nexus between the two areas.

They identified four main strategies used by institutions to strengthen the research-teaching nexus:

- Developing institutional awareness and an institutional mission.
- Developing pedagogy and curricula to support the nexus.
- Developing research policies and strategies to support the nexus.
- Developing staff and university structures to support the nexus.

The first strategy can be pursued by creating and delivering an institutional mission and making it prominent in the daily life of universities. This can be implemented through a broad range of measures such as publications, events and workgroups for RBTL designed to provide information about what research-based

teaching and learning are and to show that it is important for universities' strategic goals.

For this purpose a workgroup was formed in 2012 at the UZH to prepare the main theoretical background and to make it available to all members of the University and a website was created dedicated to the topic of RBTL. In 2013 key players in the disciplines were identified and involved in University events such as a university-wide "RBTL meet-up", stimulating interdisciplinary exchange, or workshops with international experts. The Centre for University Teaching and Learning has identified good practices of RBTL which are already currently implemented at the University; they will be published in the University newspaper *UZH Journal*. For 2014 a systemic analysis will be conducted throughout the entire UZH to document a wide range of good examples of RBTL in all departments and disciplines. These examples could be released on a website or in a publication. The goal of this measure is to gain an overview over the broad variety of *all existing* forms of RBTL at the UZH and to share this knowledge with all University members.

In 2014 the results of the above-mentioned analysis (to gain an overview of the broad variety of all existing forms of RBTL at the UZH) will make it possible to outline university-wide project funding (with additional funds given by the UZH) to support the development of existing RBTL-teaching projects, as well as to enable other members of the teaching staff to develop new forms of RBTL in their teaching. To support the development of a great number of RBTL-projects the Centre for University Teaching and Learning will arrange workshops, conferences and presentations for the involved teaching staff (who are also always involved in research at the UZH) to share their experiences and to learn from each other.

The second strategy of developing pedagogy and curricula may include making changes to allow students' research to fit into teaching, such as altering the order of modules or integrating research projects into the curricula.

The third strategy – developing research policies and strategies to support the nexus – is at the moment not (yet) a strategy at the UZH. Jenkins and Healey (2006) observed that most of the activities to strengthen the nexus between research and teaching came from the pedagogical side. One possibility to change this and involve research in teaching could be to develop research policies that support the nexus: highly ranked researchers could be involved in teaching, new research could only be funded if the projects declare their support for student learning, or research projects could involve students on a regular basis.

Finally, the development of staff and university structures to support the nexus – the fourth strategy of Jenkins and Healey – is essential to strengthen the nexus, as the teaching staff has a key position, uniting research and teaching in one person, in particular in a research-intensive university where most of the teachers are involved in their own research projects. They need the concept of RBTL, as well as strategies and tools to integrate their research into their teaching activities.

To support the teaching staff the Centre for University Teaching and Learning is also trying to integrate the idea of RBTL into its existing study programs, workshops and counseling services for the teaching staff and to develop a systematic qualification program to qualify young teachers in RBTL. Section 6 describes the curriculum of the

systematic qualification program, developed by the Centre for University Teaching and Learning for the teaching staff, which was developed to fit the requirements of RBTL.

In addition to this support, the Centre for University Teaching and Learning recognizes staff development as a key strategy to strengthen the nexus. Based on the results of the university-wide analysis and on the needs of the funding projects, in 2014 or 2015 the Centre will create different forms of support for the teaching and research staff (and perhaps for the involved students) to enhance their competences in sustainable research-based teaching and learning.

Existing RBTL projects at the University of Zurich

Despite of the lack of a systematic analysis at the moment (see above; a university-wide analysis will be conducted in 2014) the authors have managed to gain a small insight into several programs using RBTL in teaching at the UZH. In 2012/20313 the above-mentioned RBTL workgroup carried out interviews with several teaching staff members who integrate RBTL in their teaching. The selection was more or less random and based on personal contacts and knowledge.

The following remarks are based on these interviews. There are several existing RBTL programs at the UZH: some are at Master level and some at Bachelor level, some have newly designed curricula and are systematic parts of it, while others are only single projects at a course level. Some run throughout the whole research process, while some focus only on phases of the process.

The following table shows a selection of well known research-based teaching and learning projects at the UZH to illustrate the broad variety of implementation.[1]

Level / Field of discipline (selection)	***Systematic part of curriculum***	***Unique part of curriculum***
BA level		
- Life sciences: biology	X	
- Arts: popular cultures, ethnology, archeology	X	
MA level:		
- Life sciences: geography, medicine		X
- Economic sciences: human resources		X
- Social sciences: media economics and management		X
BA and MA level:		
- Life sciences: biology	X	
- Arts: popular cultures, ethnology, archeology	X X	

Table n. 1. Selection of Research-based teaching and learning projects at the UZH

[1] Please note that this is only a selection.

Although this is only a selection, the table shows that the RBTL projects at MA level are often single projects at a course level. RTBL projects at BA level seem to be offered when RBTL is systematically integrated into the curriculum of the study program; thus different forms of RBTL can be found at both BA and MA levels.

In this article two projects are presented: a course project at Master level (Example A) and the implementation of a curriculum project at Bachelor and Master level (Example B) in which all modules are coordinated to support research- based learning.

Example A: RTBL course project at Master level (Geography)

The Department of Geography offers a so-called "integrative project" for MA students of MSc in Geography. It is a voluntary course for one semester. In this course the students work on a real research project in cooperation with an external partner. The students have the task of developing a research design (including a research question), collecting and analyzing data, and presenting the results with recommendations to the external partner. The problem or question is given by the external partner and the students are supported by a member of the teaching staff (professor) and a tutor (student). For instance, in 2012 the integrative project was an analysis of visitor dates and numbers at a Swiss national park.

Example B: RBTL curriculum project at Bachelor and Master level (Popular Cultures)

The Institute for Popular Cultures (Faculty of Arts) provides a variety of RBTL courses at all levels (Bachelor and Master):

- At BA level: A compulsory course on "qualitative methods" of one semester; the students not only learn the theory of different forms of qualitative methods, they also have to experiment with several forms of qualitative methods by conducting action research during one semester (alone or in small groups). The outcomes of these experiences and results are collected in a research folder, in which all findings are documented and reflected upon by each student or student group.
- Bachelor and Master level: In so-called "project seminars" (two semesters) the students conduct research (all steps of research process, with foci on different stages), including peer review and publication (such as an exhibition in a museum or at the UZH). The project seminars are held by different teaching staff, supporting the exchange of ideas. These project seminars are an integral part of the curriculum (for BA and for MA in the popular cultures study program), and the foci of the different project seminars are selected in accordance with the planned learning outcomes of each study program.

Experiences

The two examples above illustrate different types of RBTL projects. While the first documents a single course where RBTL is implemented, the second project is embedded in a whole curriculum, which at this point is an exception.

If RBTL projects are only based on the initiative of individual teachers, this creates specific challenges for them. First, there are the curricula, which determine the time a teacher is allowed to use for the course. Many courses last two or a maximum of four semester hours, so that it is difficult for students to go through the entire research cycle. This often involves a high workload for students and could lead to some opposition on their behalf. The curricula are also not coordinated to ensure that students have the basic knowledge required for a research-based course and as yet there is no provision for such basic training.

In addition to these structural difficulties, teachers report several difficulties, which they detect in the students' learning process. First, many students especially at Bachelor level are used to having clear structures and teacher-focused learning.

When they begin research-based learning, some of the students are unsettled by the degree of freedom they have during the semester. This can cause demotivation and excessive demands. Clear structures and continuing feedback can help the students to develop more confidence during the semester. But teachers also need more resources, such as being able to employ tutors who can accompany the different study groups.

There are also problems that are specific to the various stages of the research process. Teachers have reported that students have difficulties in formulating appropriate research questions: sometimes they are too similar to everyday questions or the questions are too broad. When the students have no experience in formulating questions, the teachers can support competence acquisition by stimulating metacognition, such as by asking students which strategies of question-finding they use or by implementing (peer-) feedback loops.

However, the difficulties described above can also be encountered during real research processes and thus some of the challenges are the challenges of the research process itself, giving students the opportunity to experience their own behavior in such a process and to develop the competences they need as researchers. Additionally, at the end of the semester many students (and teachers) are proud of the "products" they have developed. Competences such as the ability to cope with uncertainty, to ask the right questions and to solve problems in an iterative way are ones needed both in an academic environment and beyond. These were also the objectives formulated in RBTL: a deeper knowledge of the subject, which is shown through the ability to ask the right questions, to solve problems with the skills needed in the research cycle, and a change of attitude toward the insecurity of research (see Section 2: the three goals of RBTL for students).

Activities of the Centre for University Teaching and Learning to support the strategic goal of the UZH to implement RBTL in university teaching

The implementation of research-based teaching at different institutional levels raises the question as to how university teacher training and academic personnel development departments can support the nexus between research and teaching, particularly within their training programs.

To answer the question we present a short overview of the programs and then introduce the newly developed qualification programs in RBTL at the Centre for University Teaching and Learning.

The understanding of the Centre for University Teaching and Learning contains four main points:

- It is an academy for further education.
- It provides expert knowledge.
- It promotes discourse on teaching and learning within the University of Zurich.
- It understands itself as a 'future lab', which promotes innovative teaching and learning for the future.

As an academy for further education, our center offers workshops and a range of qualification programs such as one-day and long-term courses. We provide expert knowledge in our counseling services, classroom observation and coaching sessions, using a broad variety of materials, which can be found on the website of the Centre for University Teaching and Learning (www.hochschuldidaktik.uzh.ch). With events such as the annual award for excellence in teaching, we promote discourse on specific issues. We also enhance the quality of teaching with our curriculum projects in which we provide support for the faculties in developing innovative concepts of teaching and learning in higher education.

Training Programs	Début, Novice, Teaching Skills, program for professors
Courses	Didactica, à la carte
Individuals	Classroom activities, coaching sessions, qualitative evaluation
Materials	Homepage, brochures, "A to Z"
More	Curriculum development, UZH award for excellence in teaching, …

Table n. 2. The fileds of activity of the Centre for University Teaching and Learning

The different target groups consist of the entire teaching staff (professors, assistant professors, and junior or senior teaching assistants), curriculum developers and those responsible for the study programs.

In the training programs such as Début, Novice and Teaching Skills we offer different types of qualifications tailored to different target groups: For new teaching assistants, for instance, we offer a 2-day workshop before their first classes; the "Teaching Skills" program is a systematic qualification program lasting between one and three years with workshops, peer and expert evaluation and teaching experience, and an accompanying teaching portfolio.

In our "Didactica" program we offer a broad variety of workshops lasting from one to two and a half days, covering all common issues in higher education, such as articulating learning goals, planning class sessions, and designing assessments.

Furthermore, we support the faculties through the so-called à la carte program, in which we offer customized courses for the specific needs of faculties and institutes, such as "lab teaching" in the sciences.

At an individual level, the teaching staff can ask us to observe their classrooms, or request counseling, coaching and qualitative evaluation. All these offers are tailor-made, but are also supported with standardized materials such as feedback sheets for observation. On our website, which is available not only to the teaching staff of the University of Zurich, but also to the general public, we offer a broad variety of material as downloads (e.g. papers with teaching methods, as well as brochures on topics which are important for teaching at the University).

Integrating RBTL into a newly designed qualification program for teaching staff at the UZH

The newly designed training program to integrate RBTL at the UZH leads to a so-called "Certificate of Applied Sciences" (CAS), providing 10 ECTS. The CAS is a training certificate that is mainly offered in Switzerland. It consists of a program within the University's training schemes for people who already hold a university degree and have relevant work experience.

The aim of the program is to allow teaching staff to plan and conduct high-quality teaching, as well as to fulfill advisory and exam-related tasks in a thoughtful and student-oriented manner.

Its particular focus consists in introducing teachers at a research-intensive university to research-based teaching and learning, in order to enable teaching staff to engage students in ongoing research and to allow students to develop their own research skills.

In her survey, Kossek (2009) summarizes the criteria that enable and support the implementation of research-led teaching. Her criteria include the following requirements that teaching staff should fulfill:

- Teachers should see both students and themselves as learners.
- Teachers should develop teaching and learning concepts that provide well founded and organized input that encourages students to devise their own questions and to pursue them in a systematic manner.

- Teachers should open their “research workshops” and “toolboxes”.
- Teachers should endeavor to enable students to engage in ongoing critical reflection on their own knowledge and to expand their perspectives by engaging in a methodological process of self-reflection.

How will this program enable teachers to put the above requirements into practice? In training teaching staff in research-based teaching and learning, the program pursues two main strategies:

The teaching staff are introduced to research-led teaching formats by acknowledged experts in this field and are made familiar with examples of good practice at the UZH and other universities from both a subject-specific and interdisciplinary perspective. They are also familiarized with specific didactic methods, which support the students’ learning process through all stages of research.

	Topics	***Duration***
Module I / II (double module)	Basics of lesson planning Lesson plan implementation	2 x 2.5 days
Module III	Research-based teaching formats	2.5 days
Module IV	Guidance, consultation, support (leadership and supervision skills)	2.5 days (incl. 3 x 3 h of peer and expert consultation sessions)
Module V	Elective course (*Didactica* program)	2 days
Module VI	Colloquium: Teaching projects	1 day
Total duration		13 days

Table n. 3. Structure of the CAS

As a final stage, the teaching staff conduct their own project work in which they develop and implement a concept for research-based learning in their own teaching. They are also offered individual support by a specialist educational coach. This approach allows them to transfer the knowledge they have gained into a practical scenario and to integrate the concept of research-based teaching into their specific faculty.

In a concluding colloquium the participants present their projects to their peers, which are then published on the RBTL website and thus made available to the entire University.

The participants document their ongoing training and the teaching project with a teaching portfolio. This process of reflection on their own teaching, on the nexus between research and teaching and student learning, conducted on the basis of current research outcomes, reflects the principle of the “scholarship of teaching and learning“ and can play a key role in furthering discourse on research-based learning at the UZH.

In addition to workshops and project work, other formats support the participants’ reflection on their own teaching, such as teaching assessments by their peers and by experts, peer consultation sessions and the teaching portfolio.

Outlook

The University of Zurich pursues a wide range of institutional strategies intended to support research-based teaching and learning. This is part of its broader undertaking to meet the university's strategic goals for 2020, which include the systematic integration of research and teaching.

On an institutional level the University of Zurich will begin the systematic inventory of existing projects of RBTL in the coming year. This will support the visibility of RBTL and will form the basis to link the different stakeholders and will support the exchange of knowledge between the departments. It will also give an insight into which resources are needed, such as those for teachers who would like to implement research-based teaching, including tutors, travel costs and labor time, as well as special counselling and courses. It will also stimulate a new discussion about coordinating modules throughout entire study programs.

On a departmental level the University will initiate the development of tailor-made strategies to support the different needs of the faculties (e.g. bringing together the teaching staff of courses in the department to discuss the integration of RBTL into study programs).

All these activities should be evaluated to document the change. There is also a need for evaluation of RBTL at the UZH because it is unclear whether and how students and teaching staff benefit from RBTL.

The training program for teaching staff at the UZH that we have outlined here is designed particularly with young researchers in mind, in the hope that in the medium term they will be able to contribute to a cultural change in higher education, creating a stronger nexus between research and teaching. This is the first step on an individual level to initiating a new discourse on research and learning – on an individual as well as on an institutional level.

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