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DEAN'S DIGEST

"My science teachers always encouraged us to 'go out and discover something' because all scientific endeavors depend on observation and experimentation. Through such pursuits, anyone can find something new to science, and if it's truly novel, the entire edifice of science might have to be restructured."

– Greg Graffin

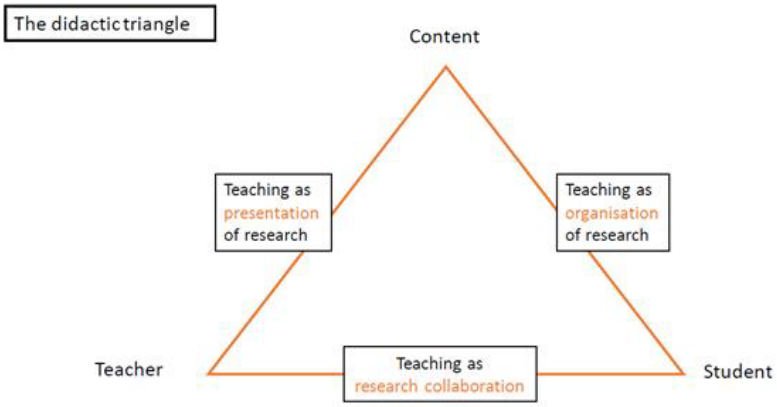
Research-Based Learning and Teaching – what are we talking about?

Research-based learning is the foundation of ITU (Universities Act, §2). Research-based teaching means that students gain knowledge, skills, and competencies based on research within the relevant subject area(s) and carry out research in their courses independently and in collaboration to internalize and practice research methods and skills. Thus, our educations are organized and conducted by active researchers with close connection to research environments of high quality. The employment categorization VIP / D-VIP ratio does not tell how to do research-based teaching. It can be done in a variety of ways and at different levels of student involvement, which this issue tries to explore. Increasing awareness among faculty on how to design and plan courses based on research-based teaching methods can help answer questions like: *How can we best increase first-year students' awareness of ITU research? How should students engage in research-like activities to ensure the best learning outcome? How can we strengthen student's interest of research and even evoke a desire for getting involved in research or pursuing a research career?*

Research-based learning is covering all our educations at ITU and reflected in our pedagogical principles. ITU define research and education as separate functions (e.g., Research and Learning support) and processes that can complement each other and lead to a common output: research-based learning. Research produces theory and evidence-based new knowledge through methodically consistent and experimental learning whereas the educations provide the students with competencies that are relevant for themselves, industry, and for society.

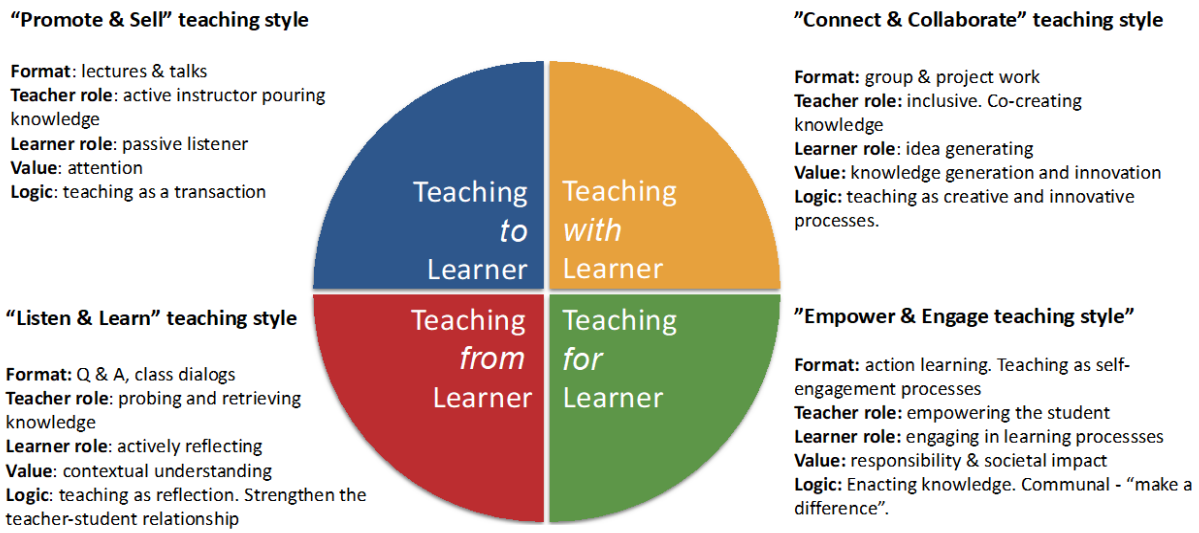
How do we "measure" research-based learning in teaching?

Research plays an important role in ensuring the quality of our teaching activities: we "measure" the learning outcome advancement from remembering, understanding, applying, and evaluating to creating concurrently with a change from teacher-centered to student-centered learning environment. Research-based learning is already integrated in the formal teaching qualification program at ITU which conceptualizes the variety of research-based teaching methods, e.g., the didactic triangle by Keiding (2010):



The didactic triangle points to different types of teacher-student interaction also mentioned in the ITU strategy for a thriving learning environment (framework below). In concert, they can help faculty reflect on when, and how, to design and measure research-based teaching that increase students' awareness, interest, and desire for research, and build research-based learning expertise and professionalism. We elaborate the four levels below.

The blue and red styles are teacher-centered and the yellow and green are student-centered



The "teaching to learner" approach is equivalent to "teaching as presentation of research" in the didactic triangle. This teacher-centered approach helps students *remember* and *understand*, for instance, the different theories and case studies of ITU. Insights into ITU research areas increases students' awareness and boost academic knowledge. Teachers can relate to research by

using research papers in class, bring forward examples of research-based learning outcomes, present their own research base and group and discuss the possibilities and difficulties for their particular fields of interest in the course.

The "teaching from learner" approach has *understanding* research as a learning outcome. "Teaching as organization of research" is efficient for developing awareness of certain research areas and research interests, considering what learning needs and interests of the students should the research cover? considering what are the consequences of taking a particular position of observation can also spark reflective perspective-taking. This style helps students acquire philosophy of science skills to define a precise research question, data processing and probing during a research process.

The "teaching with learner" approach describes "teaching as research collaboration" conducive to internalizing and practicing research methods. Involvement leads to methodological mastery when the teacher reflects on what scientific and systematic work processes (design, data, analysis, assessment) can help the students learn *with* them, like TAs do in the labs. Inviting students to participate in a small-scale study or publishing focus on the joint acquisition of new knowledge by lecturers and students. To evaluate the learning outcome in collaboration teachers must reflect on their role as teachers as well as learners.

The "teaching for learner" approach aim to engage the student in a way that can truly evoke the desire for research-based learning. Here, the learning outcome is to *create*, so the teacher considers how to empower the student to become researcher of their own study field. The labs are also obvious settings for such activities. Propose projects related to their own research that students can sign up for and conduct in collaboration with industry and other ITU students, TAs and / or researchers. Increase awareness on research project opportunities among students.

These few examples illustrate the variety of research-based learning styles and the different levels of teacher-student engagement. Please feel free to share with us your experience and also what you would like to explore in the area of research-based learning. We therefore encourage faculty and management to discuss, exemplify, and continuously develop the concept of research-based teaching and learning 'the ITU way' as part of the solution.

Pernille Rydén (pryd@itu.dk) Dean of Education, ITU

References: Keiding (2010) in Rienecker, Lotte, Jørgensen, Peter Stray, Ingerslev, Gitte Holten og Dolin, Jens (red) (2013): "University teaching and learning", her pp. 50-51