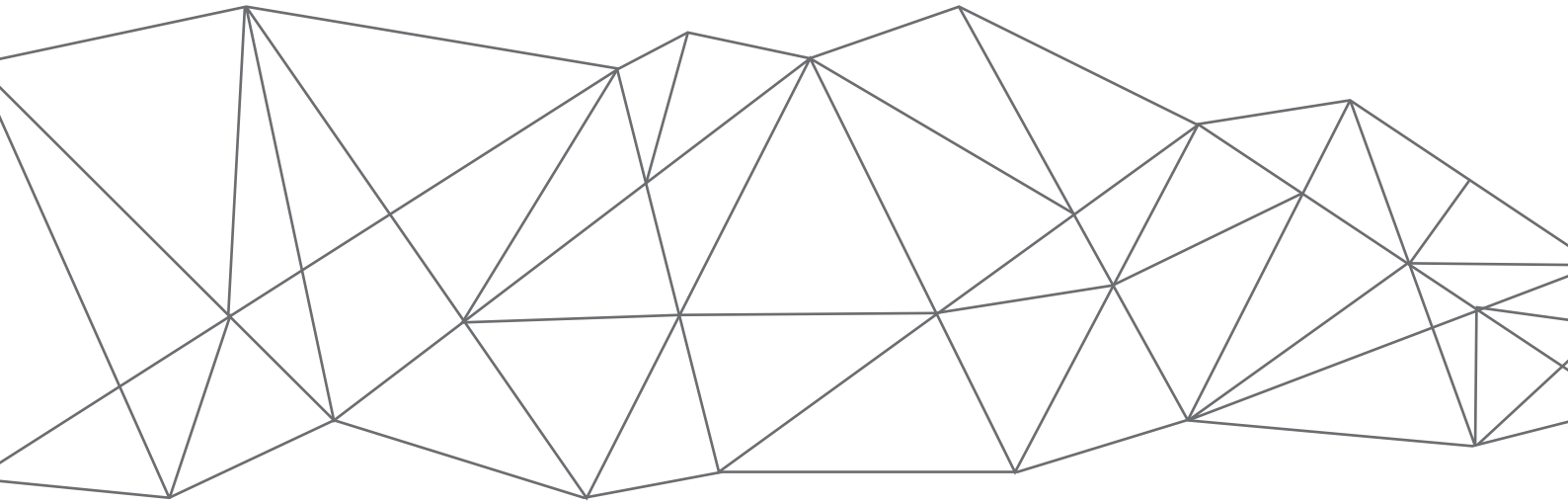
Constanze Saunders

Research-Based Learning in Teacher Education at Humboldt-Universität zu Berlin



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Research-Based Learning in Teacher Education at Humboldt-Universität zu Berlin

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Carl von Ossietzky Universität Oldenburg

Abstract

As in other programs in German universities,research-based learning is becoming an integral part of teacher education programs, also at Humboldt-Universität zu Berlin (HU Berlin). Here, all future teachers conduct research projects during practicums in their bachelor's and master's studies. Topics and research methods in these student projects vary widely. Accompanying research is conducted, supporting quality development in research-based teacher education at HU Berlin in four areas: 1) curricular integration, 2) the lecturers' perspective, 3) the students' perspective and 4) learning outcomes. Methods used include curriculum analysis, lecturer and student questionnaires, and student interviews. Research results are used for development in higher education in various ways, such as workshops and publications. Future tasks for evaluating and developing research-based learning in the HU Berlin's teacher education program need to address the narrowing down of qualification goals, the adjustment of curricular features across courses and subjects, and the development of suitable concepts and instruments for measuring target competences.[1]

Keywords: Research-based learning, teacher education, student research, curriculum, program evaluation, program development

1 Research-Based Learning in Teacher Education in Germany

When investigating factors for successful learning in schools, studies have shown that the quality of the teaching depends on the quality of the teachers – their knowledge, skills, and not the least, their motivation and enthusiasm for teaching and their interest in the students' learning progress (cf. Baumert & Kunter 2011). This has resulted in a new focus on the professionality of teachers in higher education, such as research based on the teacher competence model of Baumert & Kunter (2011, p. 32) which differentiates between various forms of professional knowledge, but also lists motivational orientation, values and goals as well as self-regulation as important aspects within questions of competence for teachers in practice. Following this wide-angle perspective on teacher professionality, innovational means were introduced in teacher training in recent years, one approach being the explicit integration of research and research-based learning in curricular frameworks. This is part of an overall endeavor in higher education to counter the teaching-research

1 The author would like to thank Prof. Angela Brew, Malte Lehmann and the publication's reviewers of this paper for their valuable suggestions on improving this paper.

nexus (cf. Healey 2005), yet also specifically to further these competences of professional staff in schools. Due to this innovation, federally funded research programs are conducted to evaluate and further develop research-based learning in German universities which can contribute to and build on existing concepts and research (cf. Obolenski, 2006; Fichten, 2010; Schüssler et al., 2017). This research project is situated in the described context, anchored in the recently founded *Professional School of Education*, a parent institution for all of the university's parties within teacher education.

This descriptive paper introduces the institutional and curricular framework for research-based learning at HU Berlin's teacher education program as well as the accompanying research done in our project. The goal of the article is to introduce a model of the curricular incorporation of research-based learning in teacher education. It also describes the way in which research is used to develop the program, following mechanisms of design-based research (cf. Plomp & Nieveen, 2013). The paper presents a series of distinct studies that have been conducted as responses to issues that arose in practice. It is beyond the scope of this paper to elaborate on research findings. Research results are only presented as illustrative examples.

Though our research is conducted within the specific field of teacher education, it might prove to be applicable to other areas as well. I hope that this article can therefore be an impulse to questions of practice and research in higher education in general, and thus helps to further shed light our common field of interest of research-based learning and teaching.

The paper begins with general observations about the use of research-based learning in teacher education and then describes the implementation at the investigated institution, including some examples of students' projects (section 2). Section 3 discusses the goals and methods of the accompanying research project. The paper offers a conclusion and further perspectives pertaining to the project and beyond.

Goals of Research-based Learning in Teacher Education

Recently, research-based learning has been declared an academic means to help further long-term professionalization of future teachers in Germany, aiming at more successful classroom practice, as well as needs of general school development (cf. Ständige Konferenz der Kultusminister, 2014: p. 3). Research-based learning is supposed to help future teachers integrate theory and practice. Referring to research in their second practicum and based on an expert panel's recommendation, Berlin educational policy argues for this practice:

> „Studierende (verknüpfen) relevantes wissenschaftliches Theorie- und Reflexionswissen mit berufspraktischen Erfahrungen und führen dazu im Sinne forschenden Lernens theoriegeleitete Erkundungen sowie Studien-, Unterrichts- und kleine Forschungsprojekte durch." (Senatsverwaltung, 2012: p. 50)[2]

Such student research projects offer a way to develop questions about practical phenomena based on theories, collect data on-site in the schools, reflect on results and develop new alternative behaviors based on theories. This cycle offers the students the opportunity to practice connecting theory and practice with the means of reflecting and improving their own teaching and general school projects. It is supposed to help students develop an understanding of classroom and school practice as an ongoing process of systematical, theory- and evidence-based development. In national educational policy, research-based learning has been explicitly named one approach to reach the defined competences for teachers (Ständige Konferenz der Kultusminister, 2014: p. 6), amongst which innovation relies most heavily on knowledge and skills acquired though this approach (ibd.:13). In Berlin specifically, student research projects have been introduced as a mandatory component of the second school practicum (Gesetz über die Aus-, Fort- und Weiterbildung, 2014: §8 (3)).

Competences trained through research-based learning are understood to develop flexibility and agency within the teachers in general, preparing them for challenges inside and outside the classroom. Specifically in Berlin and other German cites, besides a multi-faceted school system with different school profiles, schools and teachers are faced with new challenges due to a continuously changing culturally, linguistically and socially heterogeneous student population, including children with special needs and refugee background. Schools often lack supplemental personal resources to accommodate for these heterogeneous classes, posing new challenges to the teachers at work who need to be knowledgeable, flexible and self-reflective in their day-to-day practice and its development.

It is intended that integrating research-based learning in their education helps future teachers to develop a critical-reflective mindset and evaluative skills both in order to provide for a more systematic improvement of classroom practice as well as institutional development in the schools. Not the least, as in other university programs outside of teacher education, research-based learning is supposed to introduce a more research and theory-based approach to teacher education in general and thus encourage professional academic research careers.

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2 Students connect relevant scientific theoretical and reflective knowledge with professional-practical experiences and – corresponding with the goals of research-based learning – conduct theory-based investigations as well as study projects, classroom projects and small research projects. (translated by author)

2 Research Integration in Teacher Education at the Humboldt-Universität zu Berlin

In HU Berlin's teacher education program, in 2014 new curricular guidelines were introduced and mandatory research tasks were henceforth integrated in the curriculum both in the bachelor and master phases.[3] In their research-based general education modules, the students are required to conduct two research projects: one during their second and third bachelor semester and one during their third master semester (Figure 1). Data collection usually occurs during their stay in the schools. Thus, there is an effort to connect practice (school practicum) with theory- and evidence-based reflection (university courses) not only in educational goals but in curricular-structural considerations as well.

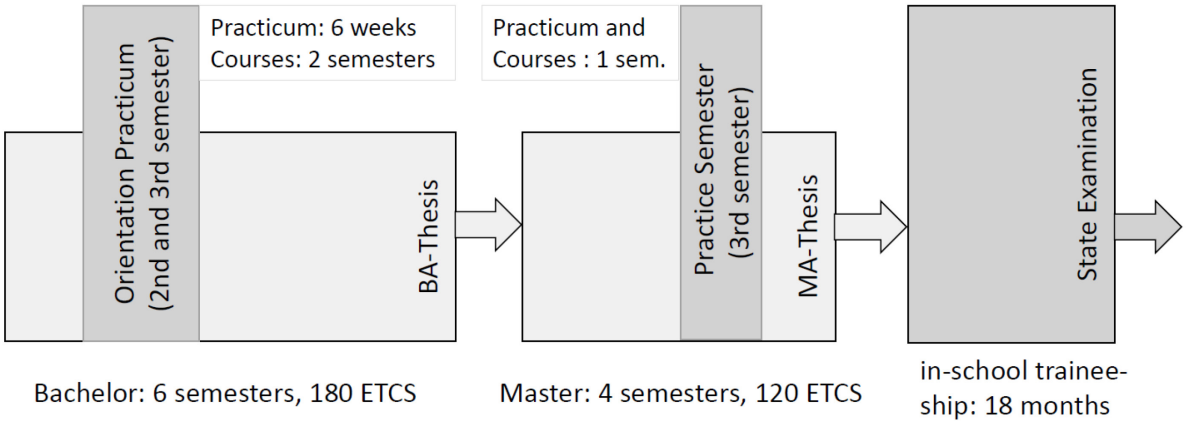

Figure 1: Teacher Education at the HU: Structure, Research Task and Exams

Whereas the BA research task is prepared and supported before and after the practicum through two related courses, the MEd research project is tightly accompanied by a seminar offered simultaneously during that third semester. Currently, both times the courses give general introductions in research methods and basic theoretical knowledge on pedagogical issues related to the students' projects. They also offer a platform for discussing planned methods of data collection and analysis. At the end of the BA course, the students compose research reports, in the MEd course, the students get a chance to present and discuss their research results extensively with their peers during poster sessions. The individual instructors differ in their specific defined objectives for their courses and sometimes focus on overreaching course topics, such as classroom management or academic language education.

3 For a more thorough description of research-based learning in general education on the masters level, see Schaumburg & Saunders, 2017.

Students' Research Projects: Examples

The projects vary widely, depending on the students‘ interests, methodological knowledge and data collection opportunities within the schools. There are usually about 15 different courses each semester in both BA and MEd (with numbers rising), and within these, there is also a variety of seminar designs, though all refer to the same module descriptions and assessment requirements. Generally, the students are free to choose their topics and research questions, oftentimes given little to no predetermined requirements from the instructors.

In the BA, the students are given six weeks to collect data, accompanied by a course before and after; in the MEd available time is one semester, accompanied by a course and a methods lecture. The students are supposed to 1) create a theoretical and empirical basis for a research topic, 2) to find or create and use suitable research instruments (observation, questionnaires, interviews, document analysis), 3) analyse data and present results and connect these back to theory, and 4) give reasons and reflect decisions made in the research process. Overall, this process resembles a complex form of research-based learning according to Rueß, Gess & Deicke (2016) (cf. Figure 2), which needs to be prepared and accompanied by various educational input (e.g. learning about methods and their use).

In their choice of topic, the students often follow their personal interests, sometimes there is a focus topic within a course they chose. The following topics, research questions and methods were chosen in a course taught on general pedagogy in a BA-seminar. They focused on more general questions of teaching practice and teacher personality.

Table 1: Sample BA-seminar topics

Topic	Questions	Methods
Classroom Management	*Which kind of disturbances occur? What strategies are used to deal with them? How can disturbances be avoided?*	Observation Student questionnaire Teacher interviews Informal talks with students
Media Use in the Classroom	*Which digital media are being used? Which do students and teachers prefer? What are the effects of new media on the students?*	Student survey (n=53) Informal talk with teachers
Cooperative Learning	*To which extent do benefits and disadvantages of cooperative learning occur? What effects do the disadvantages have further on in the classes?*	Observation Student questionnaire (n=50) Informal talks with students and teachers

Teacher Personality	*Which attributes should a teacher possess? What type of personality is especially suited?*	Student questionnaire (n=75) Teacher interviews (n=4)

The following examples are taken from a course on academic language education in schools (*Sprachbildung*) of a master's course, dealing with more specific problems pertaining to this area.

Table 2: Sample MEd-seminar focusing on language education

Topic	Questions	Methods
Strategies of language reflection	*In how far does the strategy of comparing languages further metalinguistic reflection in multilingual students?*	Self-designed test within intervention design (pretest, posttest)
Individual tutoring in reading and writing	*After three months of tutoring, on which levels (level of processing, level of subject) can changes be observed? What quality bear these changes?*	Preexisting diagnosis test within an intervention design (pretest, posttest) Student interview
Knowledge and usage of linguistic *Operatoren* [4]	*To what extent do students know and are able to apply* Operatoren*?*	Self-designed test, n=36
Means of creating coherence in written texts	*In a sample of argumentative texts, which areas of writing ability are well developed? Which areas are less well developed?*	Document analysis (20 student texts)
Refugee children's integration into regular classes	*Project 1) Which aspects support the learning process of students from special "welcome classes" having entered regular year 10 German classes in an open learning setting?*	Observation and student interviews (n=5)
	Project 2) Which concepts do teachers use to specifically address former "welcome class" students? In which areas do teachers still see potential for improving these children's situation?	Observation and teacher interviews (n=2)

4 *Operatoren*: specific verbs used in academic tasks requiring learners to perform a set of (often linguistic) procedures, e.g. to name, to report, to discuss

These tables show that the methods used are mostly participant observation, student surveys, and teacher interviews. Due to tutoring setups between teacher students and school pupils in the MEd course, some of the designs show pre- and posttests framing an intervention. The topics also reflect a wide range of interests within the BA and MEd modules, both a source of motivation and struggle for the students. It is generally seen as motivating if students can choose their own topics (cf. Harnett 2012), however narrowing down research questions, finding or developing suitable instruments and analysing collected data can be difficult. Even the listed research questions proved not entirely answerable in some projects. These 'failures' were part of the learning process and were individually and commonly reflected later in the university classroom.

3 Accompanying Evaluative Research for Program Development

The research project takes a multi-faceted view on the subject at hand and employs different methods. Firstly, we wanted to find out how research-based learning was integrated in the university's teacher education structurally within the defined curricula (intended curricula) and how it is in fact practiced (implemented curricula); the attained curriculum (learning outcomes) is addressed in some of its aspects.[5] Secondly, we were interested in evaluating and developing current teaching practice, with a focus on general education (*Bildungswissenschaft*) and prospectively, on selected subject pedagogy (*Fachdidaktiken*) classes. Finally, we aimed to contribute to the scientific discourse on researching research-based learning, such as instruments and evidence-based theories, pertaining to questions of competence development and affective-motivational factors in the student learning processes within our context. We are currently working in four target areas with four different studies to reach these goals, using various methodological approaches:

Study 1) Curricular analysis of research-based learning (analysis of 49 curricula, BA and MEd, all subjects in teacher education),

Study 2) Academics perspective, including current teaching practice of research-based learning (questionnaire study with 117 instructors; in-depth survey study and analysis of implemented practice with 14 instructors),

Study 3) Students' perspective, including challenges with research-based learning (BA and MEd student interviews and analysis of reflective texts, in progress) and

5 A description of all three types of the curriculum representation is given in van den Akker (2013: p. 56).

Study 4) Student attitudes and their changes on reflective teaching practice linked to specific elements in their classroom and research experience (outcome study, longitudinal, in progress).

These four areas are addressed within different time spans and with different intended products, such as teaching materials, workshops, publications and research instruments. Ultimately, this research is to feed selected results back into academic departments and to course instructors, e.g. in workshops and through classroom materials. For example, regular workshops are offered to the staff of the Department of Education to discuss selected topics and support teaching staff continually improving the program. The project is also supposed to help communicate the goals and issues of research-based learning to the students in the teacher education program. Both instructors and students received a collection of quotes from student interviews pertaining to the meaning of the student research projects, possible benefits and advise from the more experienced student group to the novice students. This material can serve as a basis for reflection and discussion inside and outside the university classroom. It is one of the project's central goals to address the students specifically to raise acceptance and motivation for research-based learning.

Within the project, cooperating with Christopher Gess of HU Berlin's bologna.lab, a questionnaire on students' attitudes about reflective teaching practice was developed which can be used to measure long-term changes in these attitudes and to identify useful learning opportunities. It is based on existing (Kunter et al. 2014: pp. 47; Laschke & Felbrich 2014: p. 496) and newly developed items and assesses attitudes on the significance of three topics for their future teaching practice:

- significance of educational theories (9 items)
- significance of self-directed research (6 items)
- significance of reflection (9 items)

The instrument was piloted and redesigned based on calculations of reliability and can be adapted to other institutions specific instructional prerequisites. It is currently in use in Study 4).

Methods, Materials and Selected Results

One integral tool for our understanding of research within teacher education and for analysing and developing research orientation within the program is the research-based learning typology according to Rueß, Gess & Deicke (2016). Based on a qualitative curriculum analysis, the authors introduce a model of research-related learning activities within higher education, differentiating different content foci and student activity levels:

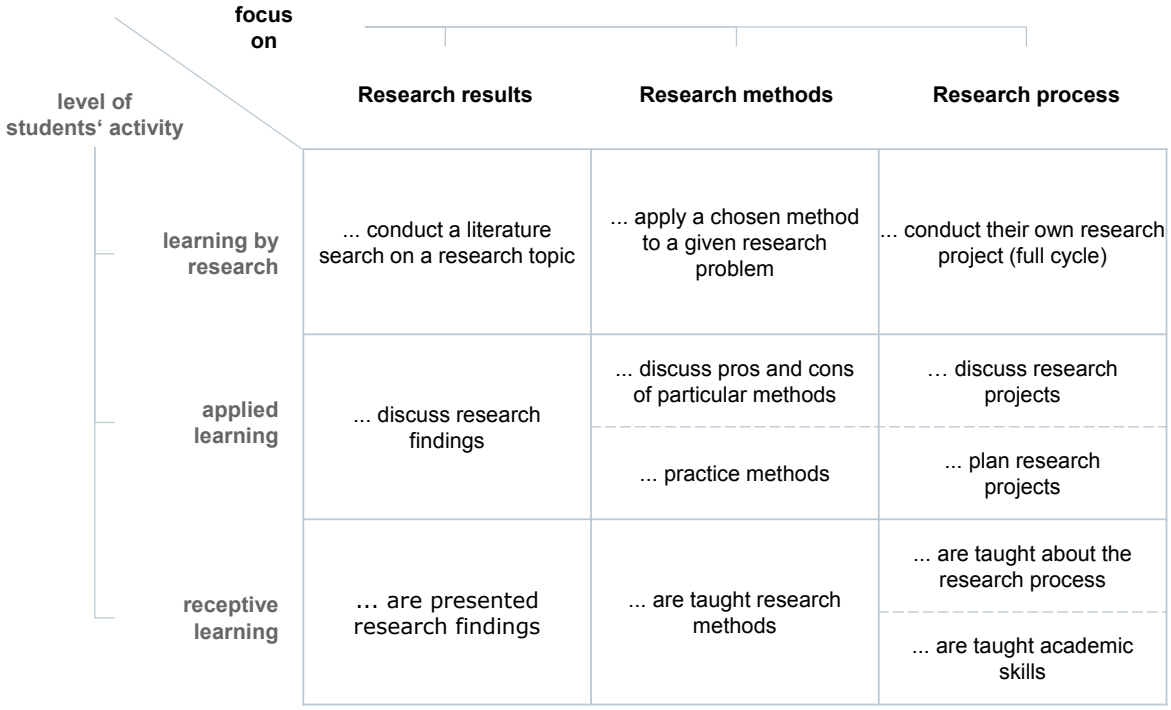

Figure 2: Research-based learning typology (Rueß, Gess & Deicke 2016)

This model can be used to distinguish and categorize different research-based teaching strategies, as well as matching different types of academic course offers. For example, lectures are located in the "receptive learning" row, whereas research colloquiums are considered "applied learning" opportunities, particularly within the category "discuss research projects". Finally, this model can be used to show academics in training and students in research-based classes about different steps when learning to conduct research. In our project, the model served as a tool in curriculum analysis and within the training of instructors to differentiate between various teaching practices and qualification goals.

In the four studies outlined, we are working with both qualitative and quantitative methods, introduced in the following section, with results being given in exemplary mode, given that analysis is in a finished or advanced state.

Study 1) Curricular Analysis of Research-based Learning in HU's Teacher Education

In order to establish a basis for our work and to identify institutional needs, the aim of the curricular analysis was to gain insight into the existing normative integration of explicit research orientation and research-based learning of the various BA and MEd program components. This overview was used to identify teacher education branches (subject-specific, e.g. history, math, foreign languages) of more and less frequent research-related learning activities for further communication, cooperation and development.

Of the existing 49 study programs in BA (n=25) and MEd (24), research-oriented modules' qualification goals and class types were coded, using the typology of Rueß, Gess & Deicke (2016) as well as a coding instrument developed by this research team of the bologna.lab at HU Berlin. Coding was done based on 13 categories and resulted in 1297 coded text segments.

The document analysis showed that research-based learning is included in curricular specifications differently amongst the subject-specific pedagogical programs. This pertains to presence and distribution of its various forms (cf. Figure 2). Some programs showed a recognizable logical progression from receptive to active, results to process; other programs offered opportunities for discussing and conducting research in a few selected courses. In general educational sciences, there was an explicit research-based component in both the bachelor's and the master's level. BA and MEd research-based curricular designs did not always correspond: some programs offered a solid basis of research contents in the BA, but did not pick it up in the next phase while a few programs required empirically based master's theses without visible preparation in the BA. Mapping the relationship between research-orientation in different phases of student development and different subjects could constitute an interesting further research project.

Study 2) Current Practice of Integrating Research at the HU Berlin teacher education programs

Besides learning about the normative, intended curricula we wanted to find out more about how these are implemented in practice in order to provide practical support in particular teaching contexts. This entailed a wider look at adademics involved in teacher education in general as well as a closer look at a small group of instructors and their courses within one particular BA module.

In stage 1 of this study, a survey of 117 academics in the institution's teacher education included participants from content sciences (*Fachwissenschaften*), subject pedagogy (*Fachdidaktiken*), general education (*Bildungswissenschaft*), and language education (*Sprachbildung*). Academics in positions of all levels participated: there were 39 full professors, 45 research assistants/associate professors, 12 post-docs, and 19 PhD candidates. [6]

The questionnaire surveyed pre-existing knowledge and attitudes towards research-based learning, experiences with the approach as well as perceived necessary institutional support to enable research-based learning courses. In specific, academic position, teaching load, college, teaching experience in higher education and student target group were surveyed.

6 Two of the participants provided no information on their position.

The main part of the survey contained items on the following topics; Likert scales of 3, 4, and 5 were used:

- sources of knowledge on research-based learning
- concept of research-based learning
- objectives of research-based learning
- practice of research-based learning in their classes
- requirements for improved implementation of research-based learning
- opinions about student research projects in the MEd practicum
- individual questions about the implementation of research-based learning

In the analysis, results were grouped and interpreted according to academic position, teaching load, college, teaching experience and student target group. For the project, especially individual questions about the implementation of research were of interest as they pointed to needs within instructors' training and communication strategies.

In stage 2 of this study, cooperating with Julia Rueß of the HU's bologna.lab, 14 instructors within a research-based learning module general education provided course syllabi and were surveyed through an online questionnaire about their attitudes and current practice. This group contained only instructors in the BA second and third semester courses (cf. Figure 1), had been in continuous program development measures within the department and cooperated within this endeavour. Results of this survey were introduced and discussed with the group in a workshop afterwards.

This second stage aimed at investigating the existing practice within one chosen module in general education, comparing it with the curricular specifications, understanding individual ways of arguing for or against research-based teaching practices within the academic group and opening up a discussion within a professional peer group. The syllabi were analysed according to their qualification goals (if visible) and covered content areas, differentiating between pedagogical, research-methods and academic working techniques/ academic writing. The questionnaire contained items and open questions on the following topics:

- course content and reasons for these choices (pedagogical topics, research methods, academic working techniques incl. academic writing)
- timing of introducing specific research-related topics
- collaborative student research
- information and feedback policy on the research report
- discussion of research-based learning in the classroom, incl. arguments for this approach
- challenges to the students with this research context
- perceived learning outcomes for the students
- technical denomination of the project

In the analysis, descriptive results were generated for these topics of interest and compared to the results of the syllabus analysis. For the presentation, there was a focus on results considered either controversial within the group or pertaining to current questions within the module: the comparison of pedagogical vs. research contents and the arguments given, existing challenges to the students, feedback practice on the research reports, collaborative student research, and the perceived functions resp. usefulness of the student research projects. Collaborative work groups created in this workshop are now developing chosen aspects within this BA module, such as a further specification of qualification goals and questions of assessment. Their work results are currently carried on into the master's module.

In the first stage study, the results showed a generally high interest and openness towards the concept of research-based learning amongst the participating academics. There was a high interest in the students' perspectives on the approach (77%), showing a need for research in this area (cf. Study 3). In order to properly conduct research-based teaching, the lecturers stated a need for more information on the principles of research-based learning, suitable material and best practice examples, opportunities for collegiate exchanges, training and more resources (time and more staff). These were important outcomes for further academic training development strategies.

Focusing on the lecturers' current practice the survey showed a pattern where the least complex and more receptive competencies connected with acquiring research competence were trained more often in the participants' courses than the more complex, productive activities Rueß, Gess & Deicke (2016) refer to as research-based learning (in the more narrow sense). Reversely, the surveyed showed gaps in the fields of applying methods, practicing and discussing methods, planning and discussing the research process and conducting a complete, own research project, with many of the academics wishing for more opportunities to fill these gaps.

This result was not surprising as these forms are the more "advanced" research activities situated at a higher progression level – both in complexity of content and student activity respectively decision-making. It reflected the challenges posed both to students and academics, and it supported the findings of the curricular analysis (Study 1). Currently, students are facing higher demands of research activity with less instructional support as their studies near towards the most complex form ("research process – researching"); and the academics see a need to support the students more in the higher levels of the matrix, possibly without suitable curricular frameworks. Ideally, the academic system and curricular structures allow both instructors and students to dedicate time to these higher levels of research-based learning, gearing towards an independent bachelor's or master's thesis confidently and with appropriate knowledge and research competence.

In the second stage of this study, results showed differences in practice pertaining to focus on either pedagogical topics, research methods or a more balanced distribution of the two, with various reasoning, often pertaining to the participating academics' own professional backgrounds. In specific, academics who placed much value on their research geared their seminars more towards their own field of interest, whereas instructors with a school teaching background and less research interest and experience were more open to a variety of topics and allowed for simpler methodological approaches. Similarly, the teaching of quantitative vs. qualitative (or both) methods often depended on the academic research socialization or preferences, not necessarily on perceived needs of the students. This implied that academic socialization, interest in research and self-image (school teacher vs. academic teacher vs. researcher) played important roles in goal selection and course design.

Concerning developing a research design, most instructors taught the students about how to plan a study and how to formulate research questions, but only few discussed research ethics. On research methods, all of them introduced observations, questionnaires, and interviews. Data analysis was most often discussed after the practicum (i.e. after data collection), the variety of methods contained quantitative and qualitative approaches, with a focus on descriptive statistics and qualitative content analysis. It remained open how suitable various methods were for the students and later on for the teachers in practice. A need to more clearly define qualification goals became apparent.

Pertaining to the feedback the surveyed academics provided to their students, it was found that the planning and execution of the research project was often extensively and intensively advised and coached, but there was much less feedback on the finished research reports besides a grade given electronically. It was concluded that for students to learn from their research experience and to draw conclusions for their future masters projects, it was necessary to consider changes in this practice, provided resources are available.

Study 3) Students' experiences, incl. challenges with research-based learning (in progress)

As stated above, we found that the surveyed academics were very interested in the students' perspective on research-based learning, and as our project aims at ensuring quality in teacher education, the students' attitudes as well as their learning outcomes are central to our research. Study 3), which is ongoing, therefore focuses on individual students' learning and research experiences, characteristics and interplay of learning opportunities, challenges and coping strategies as well as suggestions for improving their research experience, using a qualitative approach. We are sharing the results with the instructors for their course development as well as comparing the students' perspective to the surveyed instructors' perspective (Study 2) to better understand the complexity of the learning situation.

For this study, so far we conducted 23 BA student interviews, containing questions on:

– experiences with the course and research project so far
– perceived learning outcomes on the topic of educational research
– experienced and needed learning opportunities for these and better outcomes
– optional: a thought experiment to assess theory-based reflection of a study

These interviews were conducted during the second (n=12) or third bachelor semester (n=11), reflecting on either the class before or after the practicum. Here, a mixed-methods approach triangulating the interview data with the results of their questionnaires (Study 4) is planned.

With the recent introduction of the *Praxissemester* (practicum semester), we also conducted 17 interviews with masters students which focused on ways of integrating their research projects within the overall requirements of this demanding period in their studies. Often, master students didn't see the connections between their school teaching and their research tasks. In this group, five students were interviewed during the semester and at the end, seven more were available for interviews only at the end. The interview foci were:

– attitudes and experiences with research before the practice semester,
– experienced and needed learning opportunities during this semester and
– significance of theories and empirical research for their teaching practice.

As mentioned above, we see a potential in triangulating the results of both the quantitative and the qualitative investigations in order to find short- and long-term outcomes on attitudinal change pertaining to a reflective teaching practice which can be retraced to specific learning opportunities throughout the course of the teacher education program (BA and MEd). Here, results are still being formulated as analysis is still underway.

Besides, we look at our own practice of research-based learning classes within these modules. For example, 23 reflective student texts (BA n=11, MEd n=12) from the author's courses of the last two semesters were coded in a qualitative data analysis. As the bachelor students' text basis, the last chapter of their reports containing a reflective statement on their research experience has been selected, averaging one half to an entire page on average; for the MEd students, a reflective writing task from their course portfolios was chosen, one to two pages in length. The analysis focused on passages naming or describing difficulties connected with the research project, results were found based on inductively defined categories. Overall, there were 24 coded text passages in the BA texts and 81 in the MEd texts.

The analysis of these 23 reflective texts showed a variety of challenges both within the research process and pertaining to other aspects of the research experience. Further research is needed, e.g. on potential differences between BA and MEd students.

Challenges related to personal and interpersonal aspects

Interestingly, besides expected difficulties along the research path, the data showed that challenges arose from questions of identity and interpersonal aspects in the schools as well as a feeling of disorientation and insecurity based on the new experience, shared both by students at both levels. For example, for some students the interaction with others in the school along with the others' expectations about the project and possible results caused challenges (e.g. mentor-mentee differences). Besides, students mentioned to be overwhelmed by the novelty of the research experience. They described feelings of disorientation, insecurity, doubt and indecisiveness, wondering about "how to start a research project", "doing the right thing", "what to do now", "reacting to developments openly and flexibly", how to get to their set goal, not knowing what to expect, and whether ever to reach the goal and finish the project. Asked to choose metaphors for their research experience, students picked a butterfly's metamorphosis, a maze, an untamed horse, and a strenuous hike with a rewarding view from the mountain peak, for example. These images along with their descriptions in the reflective texts communicated similar feelings of loss/lack of orientation and control, gaining a grip on the task and, eventually, prevailing. Besides expected "technical" difficulties, this affective-motivational aspect of building knowledge, competence and confidence deserves and requires a considerable amount of attention in the university classroom and academic endeavours to help students conduct research, regardless of which academic field, level or research methodology. In our project, we are planning on focusing more on this theme.

Study 4) Student attitudes and their changes on reflective teaching practice linked to specific elements in their classroom and research experience (in progress)

If creating reflective practitioners for schools is one, if not the main goals of introducing research-based learning, we found it necessary to find a way to assess whether this goal is achieved in practice and to find out which didactical elements are influential in the classroom. Thus, in this ongoing research project, the focus lies on outcome and factors influencing the outcome, specifically on an affective-motivational level. This study started in 2016, it is a quantitative survey including the development of the attitude questionnaire described above. In the last two semesters, the survey was conducted in more than 45 BA and 15 MEd research-based general education courses in a pre-post-test design, overall offered by more than 20 instructors. The data collection will continue until the winter semester 2019/20 when the students of the first and second bachelor cohort will enter their final master year. This design allows for long-term and multi-method analysis of single case studies as well as overarching analysis of a large number of students. During the two semesters surveyed so far, 158 BA students and 92 MEd students took part in both pre- and posttests of the quantitative surveys. A rise of the number of participants by semester is

expected due to new regulations on student intake in the teacher education program. For this project, analysis is still underway and no results yet to be published available.

In the area of attitude development we are using a longitudinal, mixed methods design with n>100 per quantitative sample along with qualitative interviews of n>10. The complexity of such formative evaluation and longitudinal research proves challenging, yet provides for the chance to look at competence and attitude developments over longer periods of time, considering various learning opportunities within different phases of teacher education and explanations of statistical data by means of interview data.

4 Conclusion and Perspectives

This paper has presented general information about research-based learning in teacher education, given an example of its implementation at a large German research university, along with samples of student projects. It also described aims and methods of four accompanying research projects. As far as the respective goals are concerned, advancements have been made in all four projects. Since some of the studies are designed in a long-term, mixed-methods design, data collection and analysis are ongoing and results still pending.

Sharing what we learned, first results have been fed back into relevant parties within the university and are used for quality development in research-based learning courses in general education. However, communication of results and training opportunities will expand: besides general education, other individual groups will be addressed in the future. Here, for example, results of the curricular analysis (Study 1) can serve as a basis for internal curricular program development and course design processes, as well as results from the conducted surveys.

Study 2) showed various implementations of intended curricular regulations in practice, which made us wonder what the individual motives were behind these specific research-based course designs. First assumptions exist, but more in-depth qualitative interviews or group discussions with academics on selected topics will shed more light in these statistical results and the complexities of inquiry in the higher education classroom.

Pertaining to the student perspective, Studies 3) and 4) can be looked at separately and in combination. Besides answers to questions of challenges and potentials of the student research experience, the qualitative interviews (Study 3) offer exploratory assess to various questions on the student perspective, yet to be followed up. The design and results of the longitudinal affective change investigation (Study 4) will be presented to lecturers, students and within the scientific community. Case studies that entail both results from the quantitative and the qualitative studies offer a promising approach to contribute knowledge

to the field, possibly identifying types of student experiences with research in teacher education.

Out of our analysis, three main foci became apparent that need to be addressed: unclear respectively unprecise qualification goals, the necessity for more coherence of research activities throughout the program, and the development of reliable instruments for measuring outcomes.

Firstly, in educational policy documents promoting research-based learning in teacher education so far, it is difficult to find specific research competence profiles for future teachers, making it difficult to design curricula and courses. The demand of reflective practitioners who are able to understand and apply research to systematically evaluate and develop school programs and their own teaching is well meant. However, the documents fail to give specific qualification goals or educational designs based on the needs in the school context, as well as neglecting the different ideas of the nature of research in the various scientific disciplines involved in teacher education. Presumably, this lack of definition is grounded in missing concepts, though first models of teacher research activities exist (cf. Altrichter/Mayr 2004: p. 170). A more detailed set of qualification goals would allow for defining specific research training designs – much needed considering limited time to develop research and or reflective competence within the program – and help respond to the heterogeneity in implemented research-based academic teaching practice. This investigative task needs to be a common effort within the teacher education community and with the schools. With some of its results, this research program can constitute one step on this path.

Secondly, through the curriculum analysis and the surveys, we learned about the variation of research-based learning across the different components in teacher education. From a student and an institutional perspective it is advisable to offer a more logically built curriculum that provides sufficient time and opportunity to study and practice research results and methods before advancing to an independent research project. Clearly defined goals and requirements are also needed here. Besides, a balance needs to be struck between maintaining a motivating degree of freedom (Harnett 2012) for the students and reducing negative experience due to overwhelming demands. As a result of our research, we are currently looking into developing a prototype of such a spiral curriculum (cf. Harden & Stamper, 1999) based on Rueß, Gess & Deicke (2016).

Finally, resulting out of needs to evaluate outcomes, there is an ongoing effort in our project within the bigger research community to define concepts that are the goals of research-based learning (e.g. research and reflective competence). There is a need to find, adjust or develop suitable instruments to then measure these competences in order to track teaching effects and their originating teaching strategies or learning opportunities. These results

need then to be communicated to the modules' academics for application. These strategies' effects then have to be observed, evaluated and discussed for further development. A first means constitutes the attitude questionnaire on reflective practice.

So far, in this project, research goals have come out of the needs of higher education practice on site as well as general interests in the scientific community, ideally these were combined in our research questions. Our plan is to advance in this way, taking into account results and current issues in the field, comparing these to our studies' results, and foci of inquiry will be further narrowed down with the goal to support course development at HU Berlin as well as contributing evidence-based knowledge to the field in general.

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