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Linking theory and practice through University Schools – An empirical study of effective learning design patterns

Abstract

The debate of connecting theory and practice within teacher education is persistent and controversial. This article shows an approach regarding how students of teacher education perceive the connection between theory and practice through research-based learning in the context of university schools. The results of key situations experienced in a research-based learning arrangement which contribute to the relationship between theory and practice are presented in an explorative research study. The results show that this format contributes in various ways. Counselling sessions, mainly from university schoolteachers and lecturers from different perspectives, foster a better awareness of equally justified but contradictory teaching actions.

Keywords

Research-based learning, University Schools, Teacher Education, Theory-Practice Connection

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1 Introduction

"The theory-practice issue seems intractable: telling new teachers what research shows about good teaching and sending them off to practice has failed" (KORTHAGEN et al., 2006, 1038). This quotation outlines the theory-practice problem in Teacher Education (TE). The question arises: "Are there purposeful learning and teaching approaches that enable future teachers to perceive and connect both theory and practice during Teacher Education programmes?" The discussion about effective TE is not a new phenomenon but is considered to be permanently ongoing (TERHART, 2012). More precisely, the interlocking of theory and practice describes a core element of the professionalization of TE students. In the process of professionalization, this core element means enduring the tensions caused by theory and practice (KOLBE, 2002) which manifests itself ultimately in the differentiated gap between academic and practical knowledge (STRAUB & WASCHEWSKI, 2019). However, the problem lies not only in a low proportion of practical work but also especially in the lack of interaction between theory and practice. This leads to teachers showing intuitive and unreflected patterns of action (BLOMBERG et al., 2013) instead of combining scientific knowledge and practical experience when teaching.

In this context, the concept of research-based learning offers a learning and teaching approach. This contributes to the relational task by researching one's own practice from different theoretical perspectives (BREW & SAUNDERS, 2020; FICHTEN, 2010). Different understandings of research-based learning can be specified in the literature (e.g. HUBER, 2014; GERHOLZ & SLOANE, 2011; MUNTE & ROGNE, 2014). Nevertheless, one main intention is the relational task in the sense of the systematization of one's own experiences from practice through theoretically founded research. Thus, gaining new options for action for one's own professional practice (WILDT, 2005). With reference to HELSPER (2001), there are mutual relationships between practice and science that lead to the assumption that a "double habitus" should be fostered by TE students. Firstly, this means teacher's acting should be based on pedagogical knowledge and skills, and second-

ly, teaching should be reflected based on empirical results and researched methodological knowledge. Therefore, the solution and alternative to the problem described above cannot be the separation of theory and practice with a differentiated and separated design of the latter, but rather it is teaching itself which makes the relationship between theory and practice in TE a daily routine or creates tension. The TE students need the opportunity to test themselves in order to develop basic skills from practical contacts and to generate generalizable knowledge from these experiences. Thus, the intention is to let them experience the value of scientific concepts and participate directly in the development of scientific knowledge. This ideally, helps future teachers to develop a self-critical experimental attitude (TRAMM, 2001).

This article goes into detail about the previously mentioned professionalization process. Key situations of TE students, which contribute to the relationship task between theory and practice, experienced in a research-based learning arrangement in the context of university schools are presented using an explorative research approach. In addition, to what extent learning design patterns of a research-based learning arrangement in cooperation with a university school contribute to the relationship of both will be examined.

2 Linking theory and practice through university schools

2.1 Research-based learning in Teacher Education

Doing research and development is often seen as an integral part of the professionalization of teachers and TE students (e.g. EUROPEAN COMMISSION, 2014; SMITH, 2016). In this context, research-based learning serves as a learning and teaching approach that integrates research into the learning process. The concept of research-based learning can be grounded on the perspectives of educational theory and learning theory (FICHTEN, 2010).

The objective of an educational perspective is that every scientific programme should enable students to participate in research. Academics should be trained that they are able to work in a scientific manner: systematically, independently and with a critical eye on their field (BAK, 1970). In this context, science is understood as a process. University education is equated with participation in the process of gaining knowledge (GARLICHS, 1996). The educational moment is manifested in attitudes fed by characteristics inherent in science, such as finding, examining or representing. These formative moments of science can only be realized with active participation in research (HUBER, 2003). In order to meet the demands described above, the students have to be involved in the process of science and the situation must be adapted to the learners (FICHTEN, 2010; GERHOLZ & SLOANE, 2011).

From the learning theories' point of view, it is assumed that research-based learning has a considerable effect on TE students' development. Students actively and independently acquire knowledge which leads to a deeper processing of the knowledge resources. A consistent problem-orientation in teaching and learning situations is required to enable research-based learning. If research is understood as problem-solving process (GERHOLZ & SLOANE, 2011), the design of learning situations in study programmes according to the research model can be seen as a variation of learning inspired by constructivism (WILDT, 2002).

Regarding TE programmes at the university, it is necessary to consider that teaching is uncertain, unstable and cannot be planned (TERHART, 1991). Therefore, TE students must be prepared to act in such situations. Keeping this in mind, HELSPER (2004) argues that professionalization of teachers consists of the ability to recognize antinomies that exist in the teaching field and to deal with and reflect on the antinomies (see 4.2) that arise from them. The antinomy of subsumption versus reconstruction is an example: every learner, every situation is unique and has to be reconstructed differently. At the same time, the decision and problem-solving must be done according to the view of the schools' general rules and the teachers. The key situations that have to be adapted to the corresponding circumstances are mentioned here as well. Teachers face a complex package of tasks. In this context, professionalism becomes visible in the ability to handle the multiple tensions and an-

tinomies properly. In addition, different levels of management are considered. The self-critical reflection on one's own actions for professional development is especially elementary (HELSPER, 2002; HELSPER, 2007).

Empirical studies have revealed challenges by implementing research-based learning within the co-operation of universities and schools. One challenge is that the TE students do not create any benefit in terms of combining science and practice in their university education (EKLUND, 2018). Students must define their own research questions for a deeper understanding of science in advance for a successful linking of theory and practice in teaching. In addition, the integration of opportunities for reflection and multifaceted feedback discussions by all participants seems particularly valuable (BREW & SAUNDERS, 2020). Therefore, TE programmes should include references to both theory and practice and, additionally, both points of reference must be addressed during acting and reflecting. The relationship between theory and practice is examined within the framework of theory-intensive research. Knowledge about practice is systematically generated and related to one's own interpretations of practice (WILDT, 2005). Research-based learning can prepare TE students for research-oriented acting in their future fields of activity. Moreover, scientific thinking and an acting attitude can be encouraged. On the one hand, a change in knowledge and skills occurs during the research process. On the other hand, a research-based attitude can be fostered with the idea of perceiving learning and teaching situations in a scientific-based manner (GERHOLZ & SLOANE, 2011). A realistic teaching setting in the university will lead to a stronger development of the future teachers' competencies. Therefore, a strong partnership between the players in theory and practice – university and schools – can be seen as a precondition, to carrying out a research-based arrangement with connections between theoretical and practical matters.

2.2 University schools as an arena to combine theory and practice in research-based learning

A deeper co-operation between schools and universities on the institutional and organisational level seems promising to build up a stable theory-practice cooperation with the aim of enabling students' practical experience. Strong partnerships with schools are relevant to reinforce practical elements (DARLING-HAMMOND, 2006). In this context, an approach is the concept of university schools. University schools are similar to the concept of university hospitals, where teaching and research are supposed to build a productive combination and a strong partnership (GERHOLZ & WILBERS, 2018).

Three forms of school and university partnerships can be differentiated in the literature: (a) practical schools, (b) partner schools and (c) university schools (GERHOLZ, 2020; SMITH, 2016):

(1) Only loosely coupled connections between university and school are enabled in *practical schools*. The university is responsible for the theoretical and the schools for the practical insights for the students. The students are normally guided by a teacher during the school internship, but most of them were not prepared for their role by any form of mentor education.

(2) Stable relationships exist between the university and the schools in *partner schools*. The practical internship is well-planned by both sides and the university prepares the schoolteachers for their role to guide the students. Regular meetings take place for the further development of the school internship, reflection of the existing design of the internship or discussion of current challenges.

(3) The intention of *university schools* is to build a strategic alliance with a university to educate future teachers in study programmes and to cooperate in research and development. A strong relationship exists between the university and the schools in which students can participate, not only in school internships but also in common research and development projects

between the university and the university school. The teachers have completed a mentoring education at the university and mentor the students.

University schools form a third learning space for the students and for the lecturers and teachers. University schoolteachers and lecturers guide the students in their practical explorations and reflections of the prior. This is more like a traditional school internship. The active participation by the TE students in research and development projects (e.g. master thesis with the university school) or research-based development work in teaching and school development (e.g. development of new lessons with digital media for a university school) is also possible.

The concept of university schools enables innovative options to integrate research-based learning in TE programmes, especially with a strong and research-based theory-practice connection. However, the potential of the theory-practice connection in TE programmes in research studies on university schools is less established. Existing studies on university schools take a closer look at the implementation of the framework and organisational conditions (GERHOLZ et al., 2019; KIRSCHENBAUM & REAGAN, 2001) or perceived workload among future teachers (BACH, 2019). Therefore, the potential of research-based learning in the context of university schools is investigated in the following study.

3 Research context and design

3.1 Research field in the context of the university school concept

The context of the study is a module in a vocational TE programme (master level), which is designed in co-operation with university schools. The module takes place every term and follows a research-based learning design. Students are divided in small groups to work on a current teaching challenge of the university school. The students must explore the problem, investigate in relevant scientific and practical knowledge to develop a solution, carry out the solution and evaluate the final re-

sults. During this scientific-based problem-solving process, the students are guided by the university lecturers and university schoolteachers. The structure of the module is described in Figure 1.

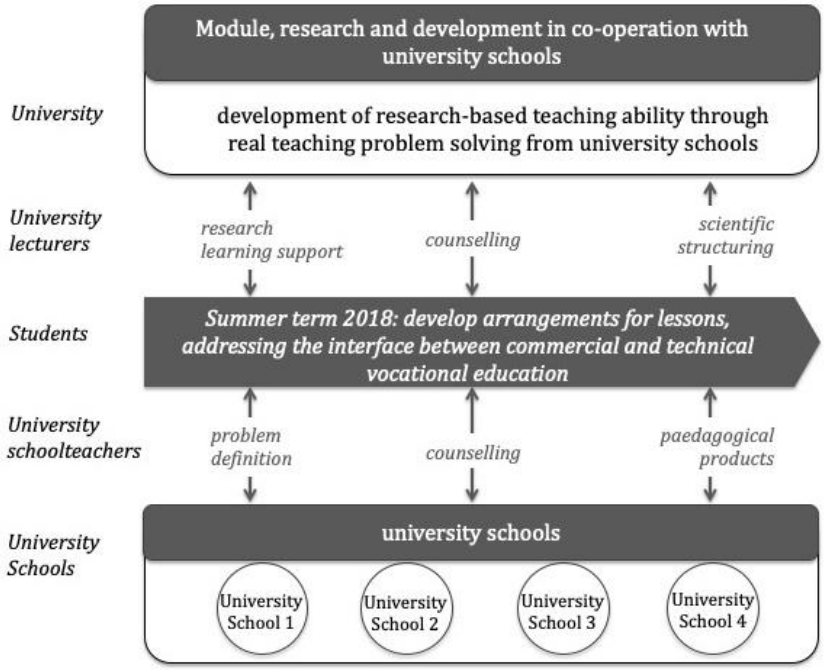

Figure 1: design of the module 'research and development work'

The challenge for the students during the summer term 2018 was to develop problem-based learning arrangements (with all teaching materials) for lessons with a focus on the interface between commercial and technical vocational education. Within this objective, teaching and learning arrangements were to be designed which combined the teaching of two vocational profiles (industrial mechanic and industrial clerk). The co-operation partners were two university schools (technical and commercial vocational school). Seven working groups were formed within the

module. Two university lecturers and five university schoolteachers guided the groups. The assessment in the course was divided into three parts: (a) writing a literature review, (b) presenting a poster with the pedagogical concept developed and (c) producing a pedagogical report with a scientific argumentation regarding the design of the lessons and the developed teaching materials.

The group sizes ranged from three to six participants. All participants of the module could provide information about the subject to be researched. A complete survey of all students who participated in the module in the summer semester 2018 is available for evaluation purposes. These are N = 30 students, 70 per cent female and 30 per cent male. The participants are an average of 26 years old (oldest 34, youngest 23).

3.2 Research-design, instruments and analysis

The study uses an explorative way to investigate the key situations in the research-based learning module which stimulates the students to think about scientific-based teaching in reflecting theoretical and practical requirements. A weekly journal was chosen as survey instrument to examine the key situations. Utilising this, the students documented their key situations at the end of every week during the module. The students were able to reproduce their experiences as freely and independently as possible through open questions in the weekly journals. Furthermore, they were asked two specific questions to describe their experiences which stimulated them to reflect on the connection between theory and practice while designing lessons:

(1) Please describe the experience briefly in your own words in the sense of a description of the situation.
(2) Please describe, why the experience stimulates you to think about theory and practice in designing learning environments?

The advantage of the method using weekly journals is the short time span between the experience and the documentation. Hence, it can be used to reduce distortions caused by a lack of memory of past events (RAUSCH, 2012). At the time of the survey, the reference period is significantly shorter and, thus, much closer to a pro-

cess-related recording (HASCHER & EDLINGER, 2009). Due to the considerably more compact time frame, the often casual and unconscious experiences can be reflected comparatively less distorted by reduction and construction through the weekly documentation in the weekly journals (MAUSS & ROBINSON, 2009).

The data in the weekly journals were collected in the module described, and the journals were analysed with a qualitative content analysis (MAYRING, 2015). A deductive category system was developed in advance which consists mainly of the elements of research-based learning (see 2.2) and, thus, also of the learning design patterns (a) input sessions, (b) counselling sessions, (c) group work phases and (d) parts of the assessment of the module. The question for the reasons, why a situation has stimulated the students to reflect on the relation of theory and practice, was viewed separately for the analysis of the selected text passages.

4 Results

4.1 Descriptive analysis of key situations

In this section, the results from the experience descriptions of the weekly journals are presented. For this purpose, the text passages are classified into one of the previously defined categories of the module's learning design patterns.

A total of 206 key situations were determined by analysing the answers to the question regarding the description of key situations (I.) and the reasons for thinking (II.). Consequently, 293 codes were assigned, which correspond to an average of 1.45 codes per key situation. The codes cover 75 per cent of the text material, whereby the remaining 25 per cent could not be assigned directly to the category system deductively developed. However, the inclusion of further inductive categories would not have contributed to clarifying the research interest. The distribution of the coded statements is shown in Table 1.

Table 1: frequencies of the main coding

Main code	Frequency	Per cent
dealing with real teaching problems	27	13
peer interaction in groups	50	24
individual experience	9	4
input sessions	25	12
counselling sessions	67	33
assessments	28	1
		100

Most of the statements made by the students are in the category of counselling sessions by lecturers and university schoolteachers (33 per cent) ("The feedback discussion with [the university school teacher, KHG, SC, PS] took place at the university. The feedback on our previous reflections took place in a very constructive discussion and provided many new and helpful impulses for further action", ALINLA2, WB6). It seems that these situations have the greatest importance in the reflection of the theory-practice relationship for the students. Furthermore, most statements are in the category "peer interaction in groups" with 24 per cent ("First meeting with group members and exchange about experiences + ideas. Question: How can we put didactic theory into practice? Review of the lecture slides and derivation of first action alternatives", ITSAÖU1, WB3).

In addition, the confrontation with real teaching problems in 13 per cent of the codings encourages students to relate theory to practice ("Even if learning situations in theory would be easy to manage, implementation in practice is often difficult", ÜRCLII3, WB2). The students frequently address the problem of digitization and interface teaching ("Digital transformation as a complex topic of today, but questionable whether the project ideas can actually be implemented in practice in this way", LLGUIL5, WB1). Although the statements in this category tend to be sceptical about feasibility, this also shows that the students incorporate their previous practical experience in the reflection on and design of learning situations. The students refer to the assessments in the module when relating theory and practice with a distribution of 14 per cent, ("Poster design for the final presentation: When designing the poster for the final presentation, both perspectives, theory and practice, had to be adapted to each other", ÜNCLIE2, WB12). With reference to the learning design elements, 12 per cent of the codings can be assigned to the category "input session" ("What made me think was Prof. X's lecture on competence orientation in teaching. In this context, I wondered whether competence-oriented teaching, as the theory envisages, can really be put into practice?" ROEROR3, WB2).

In the following, the category "counselling sessions" will be examined in more detail, because most statements of the students could be found here. For this category, all the students' statements referring to consultations with university schoolteachers and/or lecturers of the module were subsumed. A distinction was made here regarding with which group of people the counselling took place. A total of 67 text passages could be attributed to this coding; 43 codings were attributed to the subcategory "university schoolteachers" ("This week the consultation with the teachers took place in BS I.", EMMAAO1, WB5) and 21 codings to the subcategory "lecturers university" ("The experience refers to the discussion of our lesson plan, which took place at the University of Bamberg with Ms. XXX." BEGRAI3, WB6). The descriptive frequency distribution shows that the counselling sessions with schoolteachers are weighted more heavily in the relation between theory and practice than those with university lecturers. In particular, in order to link didactic models with professional applicability, "we [the students] realized the

differences between theory and practice, because the teachers told us which of our ideas were feasible and which were not" (ILKAOH5, WB5). In comparison, statements by students can also be structured, showing that, in addition to the desire for more practice, the scientific orientation has also stimulated reflection. ("We have talked about the difference between action and learning outcomes, a distinction that I was not aware of in practice until now", ETANOO3, WB11).

4.2 Connection between key situations and reasons

The interactions between learning design elements and the reasons for reflection revealed by the students which ultimately triggered the descriptions of the situation are also of interest. The categories of the reasons for reflection are based on the theoretical considerations of antinomies in teaching by TERHART (2011). The theoretically justified antinomies were used as categories for the classification of the reasons why the students thought about the connection between theory and practice. This resulted in six categories. With reference to Table 2, the most frequent reasons for thinking about the relationship between theory and practice were the antinomy of reconstruction vs. subsumption (42), followed at some distance by antinomy organization vs. interaction (21), person vs. thing (17), and proximity vs. distance (13), and, finally, with the less important nominations autonomy vs. heteronomy (9) and uniformity vs. difference (7).

Table 2: cross table between didactic elements and the antinomies of teacher action

Main codes	Peer interaction in groups	Input session	Assessments	Counselling session	**Total**
reconstruction vs. subsumption	10	7	7	18	**42**
uniformity vs. difference	4	0	2	1	**7**
organisation vs. interaction	4	6	3	8	**21**
proximity vs. distance	7	0	1	5	**13**
person vs. thing	11	1	5	0	**17**
autonomy vs. heteronomy	2	1	3	3	**9**
total	**38**	**15**	**21**	**35**	**109**

The Chi^2 test shows a significant dependence between the reasons for reflection based on confrontation with antinomies and the situation descriptions related to the didactic elements ($Chi^2(df = 15) = 28.78$; $p < 0.05$; Cramers V = 0.296). There seems to be a strong connection mainly between the following two categories: counselling sessions and reconstruction vs. subsumption, as well as peer interaction

and person vs. thing. This can be seen as a first empirical evidence that counselling sessions within the concept of the university school for practice design and theory education are effective and contribute to professionalization through the relation of scientific knowledge and practical action (HELSPER, 2001). If the content analysis of the students' statements on the two categories is also considered, a first insight into the connection between learning design elements and the reflection of teaching problems is obtained.

5 Discussion and Outlook

The aim of this study was to examine how research-based learning in co-operation with university schools contributes to the interlocking of teaching theory and practice.

The data provides hints that the counselling sessions and peer interactions help the students to relate theory to practice. The different perspectives from university schoolteachers and lecturers in the counselling phases within the university school concept seem to contribute particularly to the interlocking of theory and practice. The frequency of teachers being mentioned in the counselling process should be seen as an indication that students value the perspective of school practice more highly in the reflection process. Based on the analysis of contingency, it can be noted that students succeed in recognising the antinomies in teaching and enrich their beliefs with scientific concepts through research-based learning. This ensures a balance between the theories that are being presented during a master programme and the feedback from the practice. It should be noticed, however, that with a Cramers V of ~ 0.29, a small to medium connection can be assumed. Furthermore, the data analysis shows that the mutual support of students, which is the second most mentioned description, working on real teaching problems contributes to the relationship between theory and practice. In addition, the assessments have a little influence on the interlocking of theory and practice which should be examined more closely in further research.

The results must be interpreted in the light of the limitations of the study (e.g. small sample size, only one cohort, one course on a master level). Nevertheless, the process-oriented approach, in the sense of conducting key situations here as a weekly situation analysis, seems relevant and to give answers to the professionalizing process in TE in future research. However, this is still a retrospective recording of the subjective experiences perceived which do not necessarily have to correspond to reality.

For future research, it is also conceivable that an internship at the school or university school could be investigated in light of antinomic teaching actions with weekly journals in addition to a research-based learning module. The question to what extent the results can be transferred and confirmed in another context would be of particular interest. Regarding the forms of co-operation between a university and a school (i.e. university school versus partner school), it could be beneficial to determine whether there are differences in the perceived counselling from the teachers and lecturers as well as a relationship between theory and practice from the student's point of view.

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