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Introduction

Volker Rein & Johannes Wildt

The objectives and design of education have been moving towards each other for years in many countries at the interface of academic and professional developments (cf. Raffe, 2003). This is related to developments in all sectors of society, framed by the educational policy guiding principle of lifelong learning and promoted by qualifications and educational pathways that can be connected.

In contrast, key social actors persist in an outdated silo thinking of a separation between professional and academic education, which has led to a schism (cf. Baethge, 2007) within the education system. Policymakers are perpetuating this drift between educational pathways, as evidenced by the amendment of legislation on academic and non-academic education in Germany, for example, in recent years (cf. BMBF, 2020 and KMK, 2003). In view of changing societal requirements, however, it is overdue to put this development to the test for further consideration.

Measures to increase permeability between the educational sectors will achieve hardly anything. In essence, they miss the point of a consistent integration that could do justice to the state of knowledge of today's educational research and the resulting practical reforms. Regardless of different education systems and problematic situations, numerous design approaches have been developed – theoretically and empirically justified worldwide – without, however, setting in motion transformations that transcend academia and educational systems (cf. HRK, 2013; CEDEFOP, 2016–19; Rein & Majumdar, 2018). The anthology seeks ways out of this impasse. It intends to reflect on and further develop the discourse on the relation and integration of professional and scientific education, the related problems and options that go beyond the systemic differentiating or schismatic views traditionally dominant in academia, practice and politics.

First, basic issues in the relationship between scientific and professional education are discussed (Chapter I). Based on a dynamic interaction between

the scientification of society and the socialisation of science, central questions of *Professional-Scientific Education* are raised about the relationship between education, competence and professionalism, as well as between theory and practice. From a diachronic perspective (Chapter II), the development of the relationship between scientific and professional education is traced in its stages, framing embeddings, characteristics and intersections. This gives rise to problems of integrating professional and academic education, which are then discussed at the systemic, qualification-design and teaching levels of action in educational reform:

– at the macro level (Chapter III), the design of links between academic education and profession, which in tertiary education is largely defined by the degree programme system,
– at the meso level (Chapter IV), the curricular design of study programmes or partial study programmes (modules) in higher education with a view to the connectivity of educational programmes in initial and continuing vocational education and training outside the higher education system, and
– at the micro-level (Chapter V), the conceptual foundations of competence development and the design of courses or learning situations that concretise an integrated *Professional-Scientific Education.*

Finally, the anthology's findings are presented for discussion in theses on the conditions and possibilities for the development of *Professional-Scientific Education*, open problems and the need for further research and development are discussed and linked to a transformational scientific perspective.

1. Basic questions on the relationship between scientific and professional education

The discussion of *Professional-Scientific Education* refers to an inclusive concept of education that encompasses the entire ensemble of institutional settings in which educational processes take place. The terms scientific and professional are used descriptively at this general level to describe the social sectors in which education takes place as scientific or professional learning. The problems hidden behind this descriptive level of observation become obvious when education or educational processes are examined from theoretical and empirical perspectives.

These problems manifested themselves in Europe at the end of the 1990s in the course of the reform of academic education within the framework of the *Bologna Process* and encompassed all levels of action, from qualifications frameworks to the design of study programmes or curricula to courses. In the

midst of the debate on *Professional-Scientific Education* conducted here, the concept of competence as a guiding category was transferred from vocational education to academic education. As the vocational education function with its focus on employability moved to the centre of the reform of teaching and studies, the discussion on professional qualification in higher education received new impetus with the demand for subject-related and interdisciplinary competences.

The contribution by **Brater** and **Schrode** (Chapter I.1) leads into this topic. They focus on considerations on the possible significance of a synthesis of the education traditionally separated into vocational and academic in Germany for competence development within the framework of hybrid education. In doing so, they assume development of work requirements that are increasingly characterised by open, indeterminate and highly complex processes and presuppose scientific education as the basis of vocational competence. They understand these changes as a concrete manifestation of a comprehensive process of social change which, following Beck (1996), can be characterised as 'reflexive modernisation'. From a vocational education and training or sociological perspective, the authors find starting points for a synthesis of scientific and practical learning in competence development and draw conclusions for content-related and structural extensions of vocational competence through scientific education.

In this context, it is crucial for the discussion on the foundations of *Professional-Scientific Education* with regard to the scope of practice to take as a basis the experiences and actions under the respective constellations of conditions in which they take place. This concerns a broad concept of work that comprehensively includes intellectual activities in their respective contexts (cf. Wildt, 2007). In his "Theory of Practice" (1979), Bourdieu showed that social practices are not fixed constellations. Rather, they can be interpreted as generative structures that are constantly regenerated by the group-specific habitus of the social actors. These structures repeatedly produce the patterns of perception, thoughts and action that characterise the habitus, just like the train that lays its own track as it travels.

The teaching discourse that extends to practice in this sense and at the same time thematises scientific education cannot remain without recourse to scientific theories, methods and subject concepts. It thus inevitably leads to a debate about the question of whether and to what extent the relations between theory and practice result in a consideration of difference, whether and to what extent there are possibilities of overcoming this in the design of learning processes. How can scientific knowledge be included in the solution of professional problems on the one hand and the use of practical professional experience for questions to the sciences for professional-scientific learning on the other? One perspective for this is openend up with Young's (2008) reflections on sociological concepts of vertical and horizontal knowledge structures. In this con-

text, it must be clarified whether or how the knowledge structures in the different knowledge contexts remain compatible with each other or complement each other, influence each other, or contradict each other and how epistemic interests influence this process.

In his contribution, **Guile** (Chapter I.2) discusses implications of conceptualising a spectrum of knowledge that encompasses disciplinary, interdisciplinary and transdisciplinary aspects, including its university- and enterprise-based contexts. He proposes relating the academically controversial views on the perspectives of a *reflective practice* or the *reflective practitioner* (Schön, 1987) and the *trinity of professional knowledge* (Young & Muller, 2014). He assumes that this would enable a new perspective on the mutual relationship between theory and practice in the process of a continuous decontextualisation and recontextualisation of knowledge and practice. This could relate both perspectives to a professional practice and anticipate future changes in knowledge production.

Guile's approach, which comes from the sociology of knowledge, is complemented by **Allais**' perspective from educational science. In her contribution (Chapter I.3), she discusses the contextualisation of knowledge with the problem of assuming context-unbound learning outcomes in the context of qualifications frameworks. She sees these reference instruments and their focus on learning outcomes as a prime example of fact-free education policy. Educational research, on the other hand, points out that the apparent simplicity of learning outcomes is completely at odds with the complexity of education, including curricula, pedagogy, educational provision and the role of credentials in labour markets. In the author's view, learning outcomes, when linked to knowledge that gives meaning to educational programmes, cannot cross borders or create transparency for all relevant stakeholders. Learning outcomes should be transparent enough to be traceable to a whole range of potentially different curricula, knowledge choices and learning activities, including work and other life experiences, derived from the internal logic of the subject area and the associated logic of the knowledge field. Further, in her analysis of the correlation of theory and practice, she questions whether and to what extent skills as a bridge between knowledge and action or application can be conceptually considered and operationalised as independent (cf. Allais, 2014), as is the case, for example, in education policy-initiated instruments of qualifications frameworks (cf. UNESCO, 2016).

While the above-mentioned contributions examine the correlations between higher education institutions and professions or society, science and practice primarily in terms of the logics of action found there and their conceptual integration, it cannot be denied that the constellations within educational institutions and professional or social practice are themselves subject to profound change, which also has a momentous effect on their networks of relationships. Due to increasing reductions in basic funding, universities are forced to look for

ways to compensate by cooperating with non-academic practice. Since the 1990s, (neoliberal) models such as the entrepreneurial university (Clark, 1998) or public-private partnership (Stifterverband, 1999) have therefore gained traction. In addition to the traditional tasks of research and teaching, the so-called *third mission* (Henke et al., 2016) emerged, which targeted groups of actors outside the universities. A closer look at the programmes mentioned reveals a bias in favour of an economic or corporate orientation. This may not be surprising under the auspices of a neoliberal science and economic policy, but it is by no means compelling. As a side effect, this mission is simultaneously driving a transformation of the predominantly disciplinary science within universities towards more interdisciplinarity and transdisciplinarity. This becomes visible in a growing movement towards the assumption of social responsibility by university members. To this end, for example, fifty higher education institutions in Germany have joined forces to strengthen civic and community engagement in teaching and learning (Hochschulnetzwerk Bildung in gesellschaftlicher Verantwortung, 2021). With transdisciplinarity, transformative science is thus also growing. It is the basis for the engagement of groups of actors from academia and non-academic practice, including students, to work together on societal transformation problems. (Schneidewind, 2018; Kollmorgen et al., 2015).

The scholarly nature of teaching and study remains the distinctive feature of academic towards other types of education. However, the conventional and still dominant binding of higher education to its subject differentiation appears too narrow for the development of *Professional-Scientific Education.* This restriction can only be overcome if the development of science itself moves beyond the boundaries of the subjects. This crossing of boundaries is necessary in order to do justice to the complexity of tasks that arise in professional or social practice. Only in this way does the concept of *Professional-Scientific Education* gain substance and contour. A look at the development of science shows that constellations can arise in this way that create the conditions for success.

On the one hand, there have been changes in the institutional structure of higher education institutions in the weightings between disciplinary and interdisciplinary fields of science. And on the other hand, the scientification of society has progressed both within and outside the professional fields. Interdisciplinarity is a necessary, but not a sufficient basis for the scientific penetration of society. This grows with transdisciplinarity, which has absorbed interdisciplinarity. This has consequences for the integration of scientific and professional education, insofar as the interaction between a scientification of society and socialisation of science makes the separation between scientific and professional or social education obsolete.

Until now, the world of research was divided into a *Mode I* of subject-differentiated research at universities and a *Mode II* of problem-centred, in-

terdisciplinary-cooperative university-free research in professional or social practice (cf. Gibbons et al., 1994). In the meantime, it can be observed that *Mode II* is increasingly migrating into the universities with Collaborative Research Centres, Graduate Centres, etc., but also through interdisciplinary third-party funding. Interdisciplinary teaching can thus increasingly draw on an interdisciplinary infrastructure.

Transformative science and a correspondingly designed academic education that addresses the major problems of our time in politics, culture, the economy and ecology can only succeed collectively. Transformative learning builds on this (Defila & Di Gulio, 2018/19; Wildt, 2013) by merging science and practical education. **Defila** and **Di Gulio** (Chapter I.4) assume in their paper that academic education should enable students to engage in interdisciplinary collaborations and to take a comprehensive approach to problems that cannot be adequately addressed with a monoperspective approach. Inter- and transdisciplinarity as a modus operandi in dealing with complex questions and problems are rarely primary, but mostly additive themes in educational programmes. For a transformative approach, knowledge and experience from interdisciplinary, transdisciplinary and transformative research must be integrated into academic education. Building on a discussion of the quality requirements for interdisciplinary, transdisciplinary and transformative research, the authors discuss conclusions on various dimensions of the design and planning of educational programmes in which an interdisciplinary or transdisciplinary approach is pursued.

The need for this is also reflected in the study programme system of universities. It is true that strong bastions of subject differentiation still exist there. However, these are primarily concentrated in the area of Bachelor's programmes. Master's programmes, on the other hand, are increasingly developing into an El Dorado of multi- or interdisciplinarity, which also take on transdisciplinary features through cooperation with professional or social practice. Here, in particular, the infrastructures within the framework of higher education are developing in the sense of *Professional-Scientific Education.*

2. Developments in the relationship between scientific and professional education

Against this backdrop, the anthology's central question allows us to identify broadly comparable international developments that have taken different courses in different historical and cultural constellations and have given rise to heterogeneous educational landscapes. An adequate understanding of existing conditions and development dynamics, but even more so the development of

strategies for their transformation, should keep these path dependencies in mind. In the context of this volume, this can only be done by way of example. In this section, studies on German and British higher education development have been selected as examples, in which education through science is at the centre, but from there references to professional oriented education are discussed. Another contribution changes the perspective by choosing vocational education as the starting point and from there addressing the connectivity to the science system.

The growing importance of the scientific connectivity of non-academic vocational education and training for the demands of employment and society is evident overall (cf. Nida-Rümelin, 2014). With regard to the development of professional education within and outside of higher education institutions, the question arises as to how the interrelationship between the target dimensions of education and occupation has developed or been shaped conceptually in different countries.

In his contribution (Chapter II.1), **Wildt** assumes that academicity is to be regarded as constitutive for education within the entire tertiary education sector and, in this respect, is also formative for the design of its professional and social references. It is not by chance that academic education development emerged from this context as a theory of academic education. Wildt explains that the historically close coupling of teaching and studying to the dynamics of the science system institutionalised in the universities has at the same time advanced their decoupling in relation to profession and society. More recent developments in the sciences, which are based on a growing socialisation of science and a scientification of society, have made it possible for university teaching to play a decisive role in shaping the academic integration of scientific and professional education including its societal dimension. From there, many questions and also new impulses arise in terms academic development.

Büchter (Chapter II.2), on the other hand, deals with the relationship between vocational and academic education from the perspective of vocational and business education as an educational science discipline. It discusses the extent to which this discipline, in its development in different political-ideological contexts, with different scientific paradigms, epistemological interests and normative orientations, has conceived, reproduced and legitimised concepts of non-academic vocational education, also in relation to general and academic education. Central points of reference here are disciplinary concepts of profession and professionality, of the social structure mediated by profession and of *education in the medium of profession.* This is connected to assumptions of professional, individual and social possibilities and limits of vocational education in the education system.

In contrast to the German contribution, which takes its starting point from *education in the medium of science*, **Rospigliosi** starts from a *Vocationalism* in British Higher Education for a knowledge-based economy (Chapter II.3). First,

he analyses the relationship between academic and vocational education in universities and professions, which was already taken as a basis in the Middle Ages. He critically discusses the shaping of modern academic education in connection with the introduction of the research-oriented university on the Humboldtian model against the background of the development of industrial capitalism. Finally, in the current context of neoliberalism, the relationship between professional and academic education should be seen in close correlation with the emergence of a precarious labour force with a university degree and the limited importance of further education institutions. This development is accompanied by an expansion of the liberal professions and a growing importance of the creative industries in the post-industrial British economy. In the author's view, this context promotes a new *vocational* orientation in science education at British universities, in which the willingness and ability to learn of polyvalent graduates in particular are the necessary core competences in the knowledge-based economy.

3. Professional-Scientific Education in the context of systemic framework conditions (Macro-Perspective)

With the turn towards competence orientation in the 1990s, the implementation of cross-system education reforms on an international scale, e. g. within the framework of the EU, seemed possible, even partially with comprehensively oriented education concepts. The worldwide implementation of competence-based qualifications frameworks as reference instruments for the transparency and comparability of learning outcomes acquired in different education systems and sectors contributed to this development (cf. Rein, 2011).

However, the implementation of competence orientation has so far taken place across systems, particularly with a focus on the labour market usability of education. In the concrete design, the implementation followed the paradigms of the respective subsystems in education. A more far-reaching, cross-system discussion of basic conceptual questions has therefore not yet taken place. Despite the growing importance of scientific findings, there has also hardly been any socially compatible or at least permeable design of educational pathways.

The acceptance of a competence orientation of educational pathways across all educational sectors and the development of corresponding transparency and credit transfer procedures do little to change this finding (cf. BMBF, 2006–2012). Within the EU, the development of so-called hybrid qualification formats such as dual study programmes in Germany (cf. BLK, 2008) or degree apprenticeships in the United Kingdom (cf. UK Government, 2015) has been

promoted in recent years. In Germany, academic degree titles such as the *Bachelor Professional* and *Master Professional* (BMBF, 2020) have also been transferred to the system of vocational education and training (VET) in a way that is analogous to higher education. *Dual universities* took over structures of the *dual* VET system into the tertiary education system (cf. Duale Hochschule Baden-Württemberg). Such developments do not speak against an increased demand for academic education, but can be seen as evidence of the need for a *Professional-Scientific Education.*

Even if the trend towards academisation is certainly questioned critically in the education debate, **Langemeyer** and **Martin** (Chapter III.1) argue in their contribution based on empirical studies that higher education does not over-qualify the majority of more highly educated job seekers for the jobs they fill. On the basis of microcensus data from Germany, they discuss the correlations of vocational education background, income, standardisation of occupational fields and academisation of professions. According these data, higher educated job seekers can benefit from their degrees if their professions are academicised and if they have access to these labour markets due to their degree. Special-isations are subordinate to this effect and are absorbed in areas characterised by academisation.

The trend towards the scientification of professions, which runs across the educational pillars outside academia (e. g. in technology-based fields of work), induces skills developments that suggest the development of new forms of professionalism at the intersection of scientific and professional education (cf. Langemeyer & Martin, 2018). Accordingly, both academic education and vocational education and training would have to prepare for interactions be-tween groups of actors from higher education and non-academic practice.

National and international qualifications frameworks can take on a struc-turing function here, which, under orientation to competences, represent ref-erence instruments for transparency and comparability of learning outcomes across educational sectors. In his contribution to this topic, **Wagenaar** (Chapter III.2) discusses the possibilities and limits of qualifications frameworks across educational sectors with regard to professional and scientific developments, or a flexibilisation and strengthening of multi- and interdisciplinarity in Bach-elor's and Master's programmes. These reference instruments potentially pro-moted a competence-oriented profiling of study programmes in terms of the level of scientific and professional knowledge and its application in numerous employment and other social contexts, as well as the learning of independent and responsible action. In fact, however, the qualifications frameworks codi-fied today have so far only been applied to a limited extent in design practice. In addition, the existing qualifications frameworks are insufficiently coordinated and are implemented bureaucratically. Furthermore, academic staff often have difficulties in dealing appropriately with competence-based educational con-cepts due to insufficient further training.

Given the ever-changing nature of work demands and the sheer amount of disciplinary specialisation and fragmentation in the academic education system, the US, probably even more than other countries, faces a growing need to make post-secondary qualifications transparent and connectable. In her contribution, **Jankowski** (Chapter III.3) discusses the impact of initiatives to promote US academic education through numerous projects and measures to integrate professional and academic education. She focuses on the nationwide implementation of standardised and integrated criteria for defining the academic quality of degrees, such as the *Degree Qualifications Profile* in relation to scientific and professional knowledge and skills. Following on from experiences with these integration attempts, the author discusses the possibilities and challenges of a polyvalence of academic qualifications and scientific competences. She sees starting points for this in the *paradigm of the participatory learning system*, which has been designed to promote the integrative academic acquisition of scientific and professional capabilities.

The final contribution of this section asks about the potential of vocational schools in Germany as hinge institutions between general, academic and vocational education, and about the problems that arise in this context. In his contribution (Chapter III.4), **Harney** examines this topic in relation to the *dual system* of vocational education and training in Germany from a historical and system-theoretical perspective. He begins by stating that the legally codified system of vocational education and training has developed a functional system of its own, into which the vocational schools could only be integrated to a limited extent. Post-war developments had led to reforms that gradually changed this situation. The *dual* VET system was still very much shaped by its own logics. However, it has been shown that this has created internal system dynamics that assign the vocational school in particular an organisationally demanding hinge position between the system references of the educational and the vocational training function. The historical perspective in particular could make the reform potential contained in this development visible.

Already today there is a high degree of connectivity to science and the higher education system through the repeatedly renewed scientific foundations of subject teaching on the one hand and the scientific training of teachers at vocational schools on the other. In addition, the occupational fields in administrations and companies require scientific competences to a growing extent, which are operationalised in curricula and teaching. Conversely, it is questionable whether and to what extent vocationally oriented education with a narrow occupational reference does not come up against the limits of a broad field of activity reference with high flexibility expectations. Analogous to higher education, vocational schools also have to contribute to personality development and enable people to participate in society. It is therefore more important to clarify the institutional and conceptual prerequisites for this and

the options for designing conceptually compatible transitions from vocational education and training to higher education.

4. Professional-Scientific Education in the design of qualifications (meso-perspective)

Below the macro-level the framework for the design of study programmes is depending on the organisational structure of higher education institutions and their relations to the spheres of occupation and society on the one hand, and the relations to the other sectors of the education system, including vocational education and training on the other. The functioning of the framework is bound to rules and orders for work and communication that provide orientation for the members in the educational institutions.

At the meso level of these institutions, this includes the curricula of the degree programmes, especially at universities. The respective regulations also provide or limit the scope for the realisation of *Professional-Scientific Education.* This is explained in Chapter IV by way of examples and with analyses of structures and processes in which these regulations come into being and develop their effectiveness.

It begins with an example that is particularly relevant in the context of this anthology. Health science in Germany is of particular interest here because – unlike nursing in the Anglo-Saxon countries – it represents a work in progress in which the emergence of a professional-scientifically integrated degree programme can be observed in status nascendi. As in a *real laboratory*, the process of academisation of a formerly and still predominantly school-based vocational education can be studied here, in which the professional experience-based teaching is combined with scientifically proceeding university teaching.

In her contribution, **Walkenhorst** (Chapter IV.1) discusses the connection between scientificity and professional experience orientation in the context of the academisation of professions in the health sector in Germany, whose training is currently offered with a high proportion of practice at both school and university level. The fundamental goal of this academisation is to increase the quality of care in health and social services and to enable the professionalisation of these professions. From an educational science perspective, the author discusses the central question of how the shares of experience orientation resulting from relevant professional practice can be combined with scientificity without neglecting the requirements of science and professional practice. The contribution discusses this problem through various theoretical perspectives, which are set in relation to each other and discussed.

Focussing on vocational education and training **Buchmann** (Chapter IV.2) complements the previous contribution, because it also refers to the health professions. It conveys a picture of scientification in the world of work in exemplary form, which demonstrates the hinge function of vocational school education to higher education at the meso level discussed above by Harney at the macro level. The article furthermore shows that the work on the knowledge order, both in the curriculum and in the traditional courses of study, is itself subject to a process of scientification, which results in curriculum development respectively in curriculum research.

In her contribution, Buchmann discusses a reorganisation of the relationship between profession and science from a curriculum-theoretical perspective as conditional factors for quality assurance and quality development of qual-ifications across educational sectors. She argues that this is necessary in view of profound social transformation processes that are producing a scientification of social practice and a (re)socialisation of science. The argumentation is based on the findings of qualification research in vocational education and training, which has diagnosed new cuts in work in various occupational fields (here exemplarily in the health sector) in the context of far-reaching rationalisation processes. Based on a subject-theoretical and emancipatory interest in knowl-edge, it should be clarified how the reference points of education, science and occupation can be interpreted and concretised in the respective contexts of curricular constructions. The aim is to overcome the fragmentation of current qualification paths, in which a utilitarian connotation of occupation is pre-dominant, in favour of the development of interdisciplinary working skills on the basis of transdisciplinary knowledge architectures.

The third contribution in this section moves entirely within the argu-mentation framework of curriculum theory. It builds a bridge from the macro-level of the competence discourse to the concrete level of study programmes. The findings, which the author refers to from his own research, show how the professional perspective can merge with the scientific perspective and justify professional-scientific competence acquisition. Using the example of academic education in Germany and the USA, **Rein** discusses in his contribution (Chapter IV.3) conceptual-analytical and empirical research findings on the prerequisites and characteristics of professional-scientific competence acquis-ition for the corresponding design of curricula in Associate's (USA only), Bachelor's and Master's degree programmes. The underlying research assumes a competence polyvalence with a common core of professional-scientific action orientation oriented towards complex discipline-related and professional problems and tasks. The research interest focused in particular on relevant approaches to competence-related concepts, instruments and practices that enable a compatible relationship between scientific subject systematics and professional action systematics. The article also discusses the findings gen-erated on characteristics that, despite differences in qualifications and subject

areas as well as educational systems, could be regarded as constitutive for the acquisition of professional and scientific competences and the corresponding design of study programmes as well as of compatible vocational qualifications.

No matter how illustrative examples and empirical analyses show the conditions for the possibility of curricular developments on the path to *Professional-Scientific Education*, they cannot hide the resistance and stumbling blocks on this path. It is therefore worthwhile to look not only at the structures of the education programmes, but also at the processes in which they are created. In this perspective, one soon encounters stably anchored patterns of perception, thought and action that are reflected in tenacious behaviour, norms and expectations. This also reveals traditions that are embedded in the history of educational institutions and cannot simply be changed by decree. They point out that in order to change the teaching culture (cf. Schneider et al. 2009), special attention must be paid to process design.

In this sense, **Wildt** and **Wildt** discuss in their contribution (Chapter IV.4) the possibilities of a participatory design of curriculum development processes that arise in higher education institutions in view of the cross-university structures of the accreditation system and the internal quality assurance of higher education institutions within the framework of the European *Bologna Process.* Under the objective of *Professional-Scientific Education*, the task here is to include cooperation with groups of actors from practice and the modalities of knowledge production in the process of curriculum development. (Wildt & Wildt, 2017) In particular, it is important to bring the scientific potential of universities to bear in the practice of higher education, also in non-university spaces of experience. The two authors show why and how study programmes that follow the guiding idea of *Professional-Scientific Education* can benefit from the advantages of participatory curriculum development.

Even if the dynamics of this debate have meanwhile subsided in the context of the European reform process and university members have become accustomed to the changed study structures, it is currently difficult to judge whether and to what extent the *Bologna Process* promotes the development towards a *Professional-Scientific Education.* If the dominant focus remains on *employability* as a functional adaptation to the labour market, little seems to have been gained. If, however, appropriate knowledge and skills in terms of transformative competences and *citizenship* are implemented in the degree programmes, which enable the ability to act in a scientifically justified and responsible way to solve social problems and to participate in social, economic, ecological, cultural and political transformation processes, the path to a professional-scientific societally commited education is opened.

In the sense of Young (2008), it will be a matter of *bringing knowledge back* into the curricula of higher education. This will only succeed if the best aspects of scientific learning and professional experiential learning are considered and brought together in academic education and beyond.

5. Professional-Scientific Education in teaching and learning processes (micro-perspective)

Whether *Professional-Scientific Education* emerges is ultimately decided at the level of teaching, in learning situations as well as learning practices within and outside higher education institutions. Measures or reforms at the macro and meso level remain ineffective if they are not concretised at this level. To this end, it is expedient not only to explicate the concept of competence discussed in Chapter I by Brater and Schrode at the macro level, as Wagenaar did with regard to the national and international qualifications frameworks, and at the meso level, as Rein did, but also to elaborate it down to this level.

Schaper does this by discussing the relationship between professional knowledge and action from the perspective of competence and professional research in his contribution (Chapter V.1). On the basis of central approaches of competence research on the one hand (action-theoretical, cognitive-psychological, educational science approach, etc.) and profession research on the other (situation-oriented, structural, content-based approach, etc.), he discusses the complex relationship between knowledge and action on the individual level as well as between theory and practice on the socio-cultural or curricular level. Approaches and concepts in the context of the respective domain logics and the corresponding cognitive systems as well as for the design of education and training arrangements are presented and discussed (e. g. from teacher education research), which enable or promote both the development of professional knowledge and reflected practical skills.

With his concept of competence based on cognitive psychology and professional theory, Schaper takes a necessary step towards an elaborated concept of professional and scientific education at the micro level. However, this step alone does not seem sufficient. In this respect, its contextualisation in an "education in social responsibility" (cf. Hochschulnetzwerk Bildung für gesellschaftliche Verantwortung, 2021) is target-oriented. One concept for this is *Service Learning*, which paradigmatically complements *employability* as a goal of the Bologna Process through the guiding idea of *citizenship. Service Learning* is the focus of **McIlrath**'s contribution (Chapter V.2). It figures as a prototype of a pedagogy in the wake of John Dewey that aims to prepare students for their role as citizens in society by combining their academic knowledge and skills with civic engagement. *Service Learning* is illustrated here from a theoretical, political and practical perspective through three case studies to show its importance for education through practical student engagement.

However, the practical engagement threatens to lose sight of the contextualisation of *Service Learning* in the context of science. In the sense of *Professional-Scientific Education*, the path of *Service Learning* leads beyond

socio-political impulses, whose initiative is sometimes exhausted in practical activity, to a connection to the system of university courses. *Service Learning* is thus transforming itself into a teaching-learning concept that increasingly combines education in the practice of social responsibility with *education in the medium of science.* This is the decisive step towards an integration of the structure of science and the structure of learning at the micro-level of higher education teaching, in which *education in the medium of science* and *education in the medium of practice* are combined (cf. Wildt, Chapter II.1).

In his contribution (Chapter V.3), **Wildt** shows ways in which this integrative claim can be realised in approaches to higher education teaching that are both science-based and practice-oriented. The possibilities are inherent in traditional academic structures and course formats. Since its institutionalisation, university teaching in research and development has already generated a considerable fund of knowledge and options for action. The article elaborates on this in excursuses on event formats of research-oriented, project-oriented and transformative learning. Students and academics do not generate questions and approaches solely from their own prior understanding. Rather, groups of actors from social practice within or outside the professional sphere come into play in the definition of goals and the design of transformation projects. Moreover, transformation projects usually take place in practice outside the universities, often in so-called *real laboratories* or under the real conditions of social life and work. One of the difficult tasks of transformation projects is to balance the different objectives and possibilities for action that emerge in these constellations.

For *Professional-Scientific Education*, it is not enough to justify the knowledge and skills to be imparted or acquired theoretically and methodically. This applies in principle to any educational programme, especially at the tertiary level. In the context of scientific teaching and learning, there is also the task of making scientific knowledge the subject of teaching and learning. This strengthening of the subject position, which, following the *shift from teaching to learning*, means that students take on more responsibility for their learning process than in a teacher-centred higher education, remains, however, without further ado in the space of the university. However, students are also prepared to take on social responsibility by taking on learning with commitment in non-university fields of action, as in *Service Learning.*

Science, also mediated through higher education, does not function as a defining power and decision-making authority for practical action in the role of a legislator, but in the sense of an interpreter (Bauman, 1987). The perception of this role is only possible on the basis of a competence for *transfer*, i. e. the ability to *translate* scientific knowledge into practice in the sense of a mutual connectivity of higher education and non-university knowledge production. A prerequisite for success is open communication and cooperation between scientists and groups of actors from other professional fields or society in attempts

to solve practical problems. When it enters the context of the debate on today's key problems, *Professional-Scientific Education* stands in the midst of socio-ecological, economic, cultural and political transformation.

Starting questions and perspective of the discourse on Professional-Scientific Education

Starting from the problems between professional and scientific orientation of education, as discussed on the systematic aspects and levels of the topic in the reciprocal relationship of science and society and in its diachronic development, the anthology intends to lead the discourse along the following initial questions. These point to the main areas of tension concerning the topic and can at the same time serve as *common threads* in the discussion of *Professional-Scientific Education*, its theoretical foundations and design options.

– What problems and options arise from scientification for the relationship between occupation and society?
– Which parameters characterise the genesis and manifestations of the schism between science and profession or education and training and which development options and limits for overcoming it can be identified?
– How can *Professional-Scientific Education* be made compatible in the context of the diversity of educational pathways within and outside higher education?
– Can the concept of competence be integrated into the framework of a corresponding professional-scientific theory of education?
– How far does the inclusion of scientific theories and methods extend into professional practice and can practical professional experience be used in research and scientific learning?
– To what extent are disciplinary knowledge and practical action-related knowledge connectable with regard to a changed perspective of the relationship between theory and practice?
– How are the interactions between macro-level, meso-level and micro-level to be considered and designed for a successful implementation of *Professional-Scientific Education?*
– What kind of learning processes and their design meet the requirements of *Professional-Scientific Education?*
– To what extent do disciplinary, interdisciplinary and transdisciplinary developments contribute to the emergence of hybrid *Professional-Scientific Education* and relevant qualification formats?

- To what extent can reference points for the design of integrative *Professional-Scientific Education* be gained from the connection between the person, science and society?
- What problems and options are involved in integrating *Professional-Scientific Education* in transformation processes?

Even if the discourse also refers to the existing segments of systemically bound academic and vocational education, in the anthology it is directed in particular to the conditions and possibilities of its realisation with regard to *Professional-Scientific Education*, wherever it is designed and practised. *Professional-Scientific Education* is discussed here in the sense of a comprehensive qualification for empowerment in academic and social contexts of demand as well as in the dimension of personal development in this context. Academically educated people are polyvalently enabled to solve complex professional tasks within and outside the academic context (cf. Markowitsch 2004). Those with non-academic professional qualifications can expand their professional capacity to act in the face of more complex requirements by acquiring suitable scientific competences.

Professional-Scientific Education thus aims at a scientifically reflected reciprocal connection between theory and practice, which is polyvalently effective in fields of practice and action in all areas of society, including references back to the disciplinary and interdisciplinary development in science itself. It is thus shaped in the interdependent dimensions of education, profession and science (cf. Kutscha, 2016).

The labels *professional* and *scientific* are used here neither dichotomously nor in a systemically bound understanding, as this corresponds to their historical development and their social and labour market significance. They serve here as conceptual bridges that initially refer to different subject areas and are contextually bound, but at the same time can be described from complementary perspectives without calling into question the specific character of research-based scientificity of teaching and learning in the context of academic education vis-à-vis other types of education and qualification.

In this linkage, the editors define the label *professional* here as a subject-bound ability to cope with as well as to shape complex requirements (object), which in the required education and qualification processes goes hand in hand with the development of a mature personality. An extra-transformative as well as intra-transformative ability understood in this way is acquired and further developed in reciprocal relations of employment-related and other social contexts and developments that require specific academic education. An aptitude described as professional in this way distinguishes itself from a purely utilitarian-economic exploitation perspective. It points beyond the context of meaning of corresponding qualifications such as the classical academic professions as well as the non-academic qualifications marked as *vocational.* It

differs from the subject-independent labelling *occupational*, as is common, for example, in labour market-related classifications.

This definitional approach to the term *Professional-Scientific Education* has been undertaken by the editors from the specific discourse perspective of this anthology. In doing so, they are aware that in the context of different educational traditions worldwide, the same phenomenon can certainly be conceptually designated and discussed in different ways, which is also reflected in the contributions to this anthology.

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