Chapter 20
Research Training for Doctoral Candidates in the Field of Education and Technology

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20.1 Introduction

The doctoral program "Education & Technology" (E&T) is the result of previous efforts to internationalize and structure the doctoral dissertation with the aim of improving the scientific quality, the international scientific competitiveness, and also the individual feasibility of doctoral projects in education and media technology studies in a generalized way. Intensive international exchange programs and target agreements at the Technical University Dresden were established to support the E&T program and the curriculum development project necessary to initiate the program. The goal was to develop institutional structures to support doctoral candidates and to contrive a sustainable solution.

These activities have been utilizing common and local project funding synergistically and were supported by partnering institutions, so as to enable an effective contribution to the long-term stable, and thus sustainable, development of the doctoral program. The main activities of the partners within E&T are:

1. The development of an international curriculum for the doctoral students, coordinated by the three doctorate-granting core universities and possibly other partners, thereby offering Web 2.0 methods for cooperation within the international peer group, supplementing the existing E-Learning content and applications
2. To hold an annual summer school, usually lasting 10–14 days, which alternately takes place at the participating university and specialist or teacher training colleges
3. The facilitation of international practice phases for doctoral students at a research institution involved in the network

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4. The development of internationally structured and focused doctoral regulations with the possibility of two doctorate-awarding universities granting joint international degrees in the form of a co-Tutelle
5. The development of mechanisms for marketing, recruitment, and staff development, the promotion of qualified selection mechanisms to assure the selection of suitable candidates, and effective career development
6. To develop and implement an independent scientific evaluation of E&T.

The following figure illustrates the interaction between the participant-related elements in their originally planned configuration (Fig. 20.1):

An extensive, although with regard to local services from partner institutions not complete, overview of the activities and services for doctoral students can be found on both the doctoral training network[1] website and the TU Dresden Faculty of Education website.[2] Here, it is evident that the activities have evolved from the original project into a specified curricular structure in order to ideally serve the needs of the dissertation phase and the respective audience, with this process resulting in the structured doctoral program.

20.2 Challenges for Research on Teaching-Learning Technologies Between Specialized Scientific Justification and Transdisciplinary Project Orientation

20.2.1 Initial Situation and Problems

In 2008, the Media Centre of the TU Dresden was founded to meet the supply and service tasks of facilitating the development and introduction of information and communications technology in teaching, study, training, and research at the TU Dresden.[3] The center was preceded by two parallel existing precursor institutions, the solely service-oriented Audio-visual Media Centre and the strongly research-oriented Media Design Centre. With this background, the new Media Centre has evolved from a basic working and research site to a hub supporting young scientists in the field of “Education & Technology”.

The research topics include E-Learning, knowledge organization, multimedia applications, an introduction into multimedia teaching, and learning opportunities for education and training at the TU Dresden. All faculties and institutions of the TU Dresden cooperated in creating this endeavour, and suitable policies for staff and organizational management were established to support the institutional integration of these technologies throughout the entire university.

[1] cf. http://www.edu-tech.eu [December 30, 2017].

[2] cf. http://www.tu-dresden.de/ew/doc [December 30, 2017].

[3] cf. http://tu-dresden.de/mz [December 30, 2017].

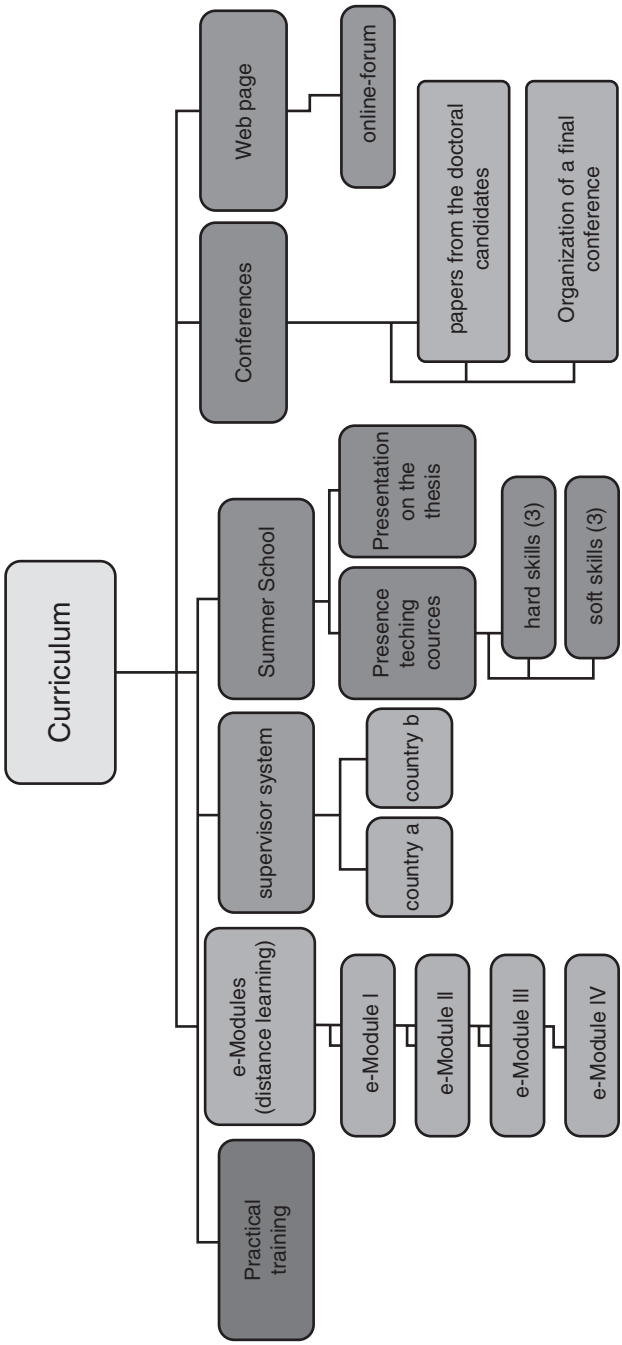

Fig. 20.1 Main components of Education and Technology

Most current research projects dealing with the development of practice follow an interdisciplinary approach. National and international comparison reveals that this development is not unusual – indeed a number of particularly larger colleges follow a similar approach, trying to bridge the gap between research and service. Although not always focused on the media domain, German examples include the Media Centre of the University of Leipzig, studium.digitale at the University of Frankfurt/Main, and the University Didactic Center Dortmund. International comparisons include the LISEC at the University of Strasbourg and Intermedia at the University of Bergen – which also illustrates a trend toward commercialization of (research) services, similar to the spin-off of Education Sachsen Enterprise owned by the public universities in Saxony.

As a central scientific institution, the new institute "Media Center" does not have permission to award doctorates; however, it employs a large number of young scientists from various disciplines. In order to use the scientific profile and to generate a sufficient level of innovation, it was and is necessary to offer qualification opportunities for young scientists. At the Media Center, the young scientists are normally employed in one or more of the many research and development projects on a third-party funding basis. The researcher's qualifications span several disciplines of educational, social, media, and possibly economic science, teaching, computer science, and other areas, creating a multitude of individually unique cases. Additionally, intensive, often project-related, reasons lead to university-wide and international cooperation with a lively exchange and research and transfer partners at home and abroad.

More so than many academic domains, research on online learning requires multidisciplinary teams, typically consisting of scientists from pedagogy, media informatics, and other application domains. Specialists from other disciplines complement these fields, forming a heterogeneous mosaic of various qualification backgrounds with great variation in terms of knowledge, research methodology, and localization of the scientific domain. This problem has itself been the subject of research (Reitmaier 2011). Although there are now interdisciplinary courses teaching education or university didactics (e.g., the Master of Higher Education at the University of Hamburg[4]), not all doctoral students have access to sufficient theoretical resources.

To make matters worse, gaining access to doctoral programs at many schools is impossible without relevant pre-qualification in a certain domain, for example, a diploma in computer science or a master in education – even if the candidate has been scientifically active for several years and was even able to submit international publications. Another potential for conflict lies in defining the list of accepted scientific approaches, since the interdisciplinary perspective in the participating sciences typically advertises positions on the edge of the discipline rather strongly and provocatively.

Sometimes, the interdisciplinary approach also experiences lower acceptance and is considered inferior research. This is not a new development, as shown when, for example, in the natural sciences the position of special didactics is weakened

[4] https://www.hul.uni-hamburg.de/studium/mohe.html [December 30, 2017].

when professorships are replaced by employment for academic lecturers (cf. University of Potsdam) or when several independent methodology chairs are merged into one so-called area of didactics (cf. TU Dresden). Their innovation potential is often underestimated by the so-called basic science disciplines, prevalent in their hesitation to transfer the respective special didactic chairs from the science department to the education department (cf. TU Dresden).

20.2.2 Disciplinary Research Approaches and Curricula of Participating Chairs and Professors

How can solutions to this range of problems appropriately address both the need for the creation of a scientific profile of a multidisciplinary field and the challenges provided by the theory-practice transfer? A first requirement is the adequate training of young scientists in the respective non-university subject areas – without requiring an additional second or third academic degree. For this purpose, between 2006 and 2008, an international and interdisciplinary team of scientists developed four thematic modules as part of a project funded by the Erasmus Curriculum Development plan for the training of doctoral candidates. Since their creation, these modules have been available for use in summer schools and for individual E-Learning[5]. The four selected modules deal with findings from the fields of media didactics, cultural studies, media education, and business computer science, for the essential theory approaches on an introductory level, written in English (see Köhler and Misoch 2008; Köhler 2013):

1. Didactics (technology and organization) of collaborative learning (first author: Prof. Dr. Thomas Köhler, TU Dresden)
2. Social and Cultural Implications of New Media and ICT (first author: Prof. Dr. Daniel Apollon, University of Bergen)
3. Pedagogic Design of Media and Technologies (first author: Prof. Dr. Pascal Marquet, ULP Strasbourg)
4. Information Systems and Knowledge Management within Virtual Environments (first author: Dr. Maciej Piotrowski, UITM Rzeszów)

In 2014, authors were able to apply for funding of the European Social Fund Sachsen under the "e-Science Research Network Saxony" to add a fifth module covering research methodology of digital and open sciences:

5. E-Science and Digital Research Methodology (first author: Prof. Dr. Thomas Köhler, TU Dresden).

Another key element in the structured international doctoral program "E&T" is the annual summer school with about 25–35 PhD students and 5–10 teachers. These summer schools have been conducted since 2008 and, in addition to professional scientific research, always contain methodical and sociocultural activities. The sum-

[5] www.edu-tech.eu.

mer school was first funded as a so-called intensive program by DAAD 2008–2010 and OEAD 2012–2014. In 2013, support from the European Social Funds was obtained. The Franco-German University was funding a project for the implementation of a conference for doctoral students in 2014, supplemented by a bilateral Erasmus cooperation. In 2015, only funds from the national German Research Excellence Program could be applied, and in 2016 the financial basis was provided mainly by institutional funds before in 2017 the summer school was organized at the University of Yogjakarta as a joint measure with the DAAD-supported TVET alumni network meeting. This 10th anniversary summer school did therefore for the first time take place outside Europe what was a great success in both scholarly outreach and academic travel logistics. In most cases, local sponsors were also addressed successfully in order to support individual activities from each very extensive program. A detailed overview of the current activities at all summer schools is located at www.edu-tech.eu. For each of the summer schools, a special thematic focus was defined, including "Digital Culture", "E-Learning meets eScience", or "Education Research & IC Technology".

20.3 Administrative Arrangements and Developmental Needs

20.3.1 Status of Doctoral and Authorization Procedure

Graduating students can have the status of either external research assistant or doctoral student, depending on the shape and place of employment. Enrolment takes place, if desired or necessary, regardless of the recording on the list of doctoral candidates. The TU Dresden now has the option to admit scholars who do not meet the domain specific educational requirements, a policy created to regulate admission to doctoral studies in accordance with the doctoral regulations. Basic requirements for acceptance upon application to the dean are (a) the acceptance by a professor of the department, (b) a relevant specialist qualification on Master level or equivalent degree, and (c) an exposé about the research topic comprehending theoretical, methodical and project management considerations, which allows a selection decision by the deans doctoral committee.

The selection procedure developed in the context of E&T goes beyond the previous practice. This process must especially be followed in the selection of candidates in an international context, since the international field of educational science is not very standardized and as well influenced strongly by the varying approaches of individual university professors. Due to that any innovated process must also be guided by the provisions of the often renewed doctoral regulations, which also allow admission with a B.A. degree in exceptional cases, after a trial year.

One option would be the introduction of a unified selection process for all doctoral candidates, an approach followed in France. The preparation of Erasmus Mundus doctoral students at the TU Dresden is standardized and organized similarly.

Structuring the selection process of all doctoral students in a unified way would allow using previously established processes. The establishment of such a selection process requires considerable work and effort, since the selection method must be able to identify needed skills in doctoral students. Additionally, supportive feedback must be provided to those candidates not chosen for the program, enabling them to enhance their skills and consequently their future chances. The feedback should take into account the candidate's previous academic qualifications as well as the quality of the research program and in particular the scientific capacity of the prospective doctoral students.

20.3.2 Existing Doctoral Regulations and the Need for Amendment

Since 2006, the Faculty of Education at the TU Dresden has tried to improve conditions for doctoral dissertation in the interdisciplinary field of Education and Technology. With the reedition of university law by the end of 2008, a crucial framework was established in order to renew the existing doctoral regulations of 1995. This renewal required extensive discussion in the education department's council as well as a legal review. The main innovations took place in 2011 with the introduction of a paragraph on the joint international doctoral degree, the so-called co-Tutelle. It was accompanied by the implementation of a joint, bilingual doctoral certificate and also includes, if necessary, the reference to a structured form of doctoral training to be provided by coursework in the doctoral phase and the recognition of requirements completed under different technical conditions for the doctoral promotion.

The co-Tutelle was first implemented with the University of Bergen (2013), the University of Strasbourg (2015), and the University of Yogyakarta (2016). After adopting the renewed doctoral regulations at TU Dresden's Department of Education, the university partners in Strasbourg, Bergen, and Yogyakarta were tested for adaptation needs, so that the standardized implementation of binational doctoral dissertations was enabled in these locations as well. For all partnering institutes the TU Dresden's model is used as a template.

20.3.3 Measures to Comply with the Regular Period of Completing the Dissertation

Doctoral studies in the structured program E&T realistically require a period of 2.5 to 4.5 years, as shown by an unpublished analysis of about 25 degrees carried out by the Examination Office at the TU Dresden. This period is significantly shorter than the average graduation time, which in Germany is 4.5 years (Jaksztat et al. 2012).

Effective measures have to ensure the sustainable operations of the program by (1) evaluating the transparency of the doctoral program's structure in empirical studies, (2) providing a steady exchange within the peer group of doctoral students and their supervisors, and (3) supporting and guiding the increasing internationalization of the research context (Burkhardt 2008; Jaksztat et al. 2011, ibid. 2012). These three aspects require appropriate contact information and tools for cooperation and communication (Mohamed and Köhler 2010). Important elements of the structured program E&T include colloquiums, first carried out biweekly and since 2013 weekly during each semester, the summer school, the E-Learning platform with a videoconferencing solution for location-independent participation in the colloquium, a community function, domain-specific self-learning modules, and regular individual consultation appointments with the doctoral supervisor (Köhler et al. 2011).

Due to the large number of doctoral candidates with a background in social science, transferring service activities from supervisors to the community of doctoral students can promote quality and ensure consistency regarding the rejection of so-called individual doctorates (cf. Borgwardt 2012). Besides quality assurance of PhD projects, improved cooperation between doctoral students in the research context is of major importance. This cooperation must extend beyond the Anglo-Saxon model of extensive curricular shares (classes), as research has demonstrated the great importance of scholarly and research cooperation for research quality and motivation of doctoral students (Wissenschaftsrat 2011).

This cooperation may also mobilize additional resources prevalent within the peer group (Mohamed and Köhler 2010, ibid. 2011), such as access to the working results of other doctoral students, which may be accessible before their official publication without the fear of abuse of interim results. In E&T, this is applicable by the synopses of all projects planned which is made visible for doctoral students in the online platform, as well as interim results from the preprint stage and even elements from the consultations with the doctoral supervisor. This approach allows a qualified discussion of papers to be published within the group of doctoral students.

20.4 Outlook: Sustainability, Innovativeness and Dissemination

The sustainability of the structured doctoral program E&T was ensured by the abovementioned universities having incorporated the elements of a joint doctoral training into their doctoral or study rules. An important step toward securing this element structurally is achieved by strictly implementing local promotion regulations. Secondly, these international offers were designed in a way to be compatible with local regulations.[6] The abolishment of additional tuition fees in Europe and the

[6] For an example, please refer to the respective website of TU Dresden's Dept. of Education: http://tu-dresden.de/ew/idoc [December 30, 2017].

possibility of free access in accordance with the Erasmus Charter are essential characteristics of the doctoral program as well.

The network may be extended to include additional universities. Already at this stage, partners in non-European countries have expressed their desire to join the network. However, the shorttime inclusion of international prospects is currently not planned due to limited capacities. Once appropriate resources have completed the network in its current configuration, the integration of more partner institutions is planned. Additionally, analyses were performed evaluating the possibilities of using other instruments of the Erasmus program for specific target groups, such as the faculty members. This strategy has been successfully practiced by various partners as well as the Erasmus Mundus worldwide cooperation. The Department of Vocational Education at the coordinating university (TU Dresden) and national programs of non-European partners have successfully provided international teaching resources, providing the foundation for the network's extension beyond European borders. Targeted regions are mainly Central Asia, Southeast Asia, and China.

This concept is innovative in several respects: first, in terms of the joint development of a curriculum supported by various European universities. One distinct aspect is the active participation of Fachhochschulen, i.e. Universities of Applied Sciences which ususally do not have the permission of awarding a doctorate, in the network. They are involved in the Bologna phase III trials (postgraduate and doctoral studies), resulting in an expansion of the area of higher education.

Second, the concept includes innovative assistance for doctoral candidates, which, in the case of the co-Tutelle, provides two mentors from different partner universities and thus different (European) states. This initiates the internationalization of doctoral supervision and improves the quality of care.

Finally, scientific conferences serve as part of the summer schools to present the network and its scientific output to the outside academic world, representing an important opportunity for international exchange. They enable other academic institutions and universities researching the field of education, media, and technology to learn about the research of young scientists involved in the E&T and to meet them in person.

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