PEP – Programm Entwurfsbasierte Promotion

Handout: Fundamentals of Scientific Work in Design-Based Doctoral Studies

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Contents

1.   History of PEP, Protagonists, and Basic Literature on Design-Based Research.

PEP was founded in 2016 at the TU Berlin by Jürgen Weidinger, Ralf Pasel, Donatella Fioretti, Ignacio Borrego, and Matthias Ballestrem with the aim of creating a framework for design-based doctorates. Since then, PEP has offered a structured supervision program and, through biannual colloquia, a framework for the collective critical reflection of the participants' designs and design processes. It teaches suitable research methods and criteria for scientific work based on the participants' own designs and design processes.

At the time of its founding in 2016, there was no comparable program for design-based doctorates in Germany. However, the approach of using design as a scientific method of knowledge production has a long tradition outside Germany. In addition to *Design-Based Research*, a variety of terms are used for *this*, which also entail slightly different nuances in method and objective: *Research by Design*, *Design-Driven Research* (*DDR*), *Practice-Based Research*. In keeping with this tradition, PEP draws on the method and structure of *Design Practice Research*, which was developed over decades at RMIT in Australia and offers a 3-year/6-presentation doctoral program for practicing architects in the format of the *Practice Research Symposium* (*PRS*). The central figure in the conception of this program was Leon van Schaik(van Schaik 2016) . An archive of all candidates' work is available at *practice-research.com*. The first contact of PEP with the PRS was in the context of a European research project called adapt-R (*Marie Skłodowska-Curie Networks for Initial Training*, 2013-19), which was carried out by KU Leuven under the direction of Johan Verbeke in cooperation with RMIT and several European universities(Verbeke 2013; Belderbos and Verbeke 2008) . In addition to van Schaik, Richard Blythe and Marcelo Stamm from RMIT were particularly involved(Blythe and Stamm 2017). The collaboration with RMIT led to the founding of the CA^{2}RE network (*Community for Artistic and Architectural Research*), which has since continued to hold a conference on *Design-Driven Research* twice a year at different European universities and has become one of the strongest European networks for *Design-Based Research* (https://ca2re.eu/). Within this network, PEP, together with TU Berlin and HCU Hamburg, participated from 2019 to 2022 in the international, European-funded collaborative research project CA^{2}RE+ with 11 universities from Europe, which focused on design research and its relevance in scientific discourse itself. This project has resulted in three books on *Design-Driven Doctoral Research* covering the topics *of Strategies*, *Evaluation*, and *Frameworks* (Pedersen u. a. 2021; Rosa, Edite u. a. 2022; Borrego, Pasel und Weidinger 2023).

The literature on *Design-Based Research* has become difficult to keep track of. Here are a few books that are frequently referenced in the PEP:
-     On the subject of the specifics of *Tacit Knowledge*, which is practiced in design and produced through design: *The Tacit Dimension* (Polanyi and Sen 2010)
-     On explicating this knowledge: *The Reflective Practitioner* by Donald A. Schön(Schön 1983) .
-     An example of what the work of a *Reflective Practitioner* looks like can be found in Aldo Rossi's *A Scientific Autobiograpy (Rossi 1981)* .
-     Horst Rittel is fundamental to the special nature of dealing with *Wicked Problems* in design (Rittel and Webber 1973).
-     Nigel Cross comments on the distinctive nature of the *Designerly Ways of Knowing* (Cross 2010)
-     Christopher Frayling's essay *Research in Art and Design* is central to the discussion of the different goals and methods of *Research for / Research into / Research through Art and Design* (Frayling 1993) .
-     Michael Hohl also takes up this distinction in his book *Wissenschaftliches Arbeiten in Kunst, Design und Architektur* (Scientific Work in Art, Design, and Architecture), in which he formulates helpful structural and methodological tips for design-based doctoral theses, among other things (Hohl 2019).

Those directly involved in the PEP have also published relevant articles. To list a few:

- Even before the PEP was founded, Jürgen Weidinger published the book *Entwurfsbasiert Forschen* (Weidinger 2014).
- As part of the CA²RE conferences in Berlin (2019) and Hamburg (2021), proceedings with the conference contributions and additional texts were published (Ballestrem et al. 2019; Ballestrem and Fernández Guardado 2021).
- In the first part of his dissertation, *Creating Knowledge Through Architectural Design Demonstrated Through Design Experiments on the Complex Problem of Urban Sustainability*, Otto Paans provides a summary and presentation of the development *of Design-Based Research* since the 1960s, which contributes greatly to a fundamental understanding of what we do at PEP, where the scientific nature of our work lies when we create something new, and how this is revealed (Paans, Otto 2020).
- Using examples from PEP, among others, Lidia Gasperoni and Matthias Ballestrem discuss aspects of knowledge production in the annotated dialogue *Epistemic Artefacts* (Ballestrem and Gasperoni 2023) .

We have a Zotero group in which we maintain an online bibliography on the PEP. To be included in this list, please send an email with your Zotero username to Matthias Ballestrem.

2.   Fundamentals

"The doctoral process establishes that the doctoral candidate has the capacity to make an independent contribution to scientific research and development" (TU Berlin 2023). This sentence summarizes the requirements for a doctorate very concisely.

The *European Association for Architectural Education* (*EAAE*), which is closely linked to the European network for *Design-Based Research*, formulates some criteria and characteristics for quality in architectural research in its *Charter on Architectural Research* as follows: "The research is meaningful and relevant for design practices, for the discipline, for society, for culture; it explores limits and expands them […], its originality emerges from the exploration of spatial understanding and/or the creative design process; the research endeavors to make its processes and foundations as consistent, clear and explicit as possible; method, context, process and results are communicated and submitted to regular peer review and the research insights shared effectively; thesis and results are contextualized with the relevant discourses, work and literature to explicate the original and relevant contribution of the research; it creates and exploits trans-disciplinary connections" (EAAE 2022).

In the PEP, one's own design practice is an integral part of the research work. This also means that the quality of the practical work that forms part of the dissertation is also assessed. The dissertation that is ultimately submitted for the doctorate therefore consists of practical work, documentation of the PEP exhibition(s), and text. Like any academic work, the dissertation in the PEP program develops from a research question that is to be answered within the work. The more precise and limited the question, the easier it is to argue your case.

If a design-based dissertation refers to one's own work that is already sufficiently comprehensive, the research question is often not yet clear at the beginning of the work and only crystallizes in the early stages of the doctorate. The reason for this is that in most cases, the knowledge is implicitly embedded in the work and only gradually becomes apparent through questioning and observation of the work and one's own design process. The first designs are already out in the world, but an underlying and connecting question remains implicit at first. It is only through further and increasingly

focused design work within the framework of the doctoral program that the design reflection begins, highlighting the scientific nature and relevance of the dissertation topic.

The demand for the creation of new knowledge therefore requires a critical depth of reflection in order to develop design-based and scientific insights. It is not enough to describe, summarize, and publish knowledge that is already openly available in artifacts. Rather, it is a matter of developing a new perspective on design through design, thereby making meanings, connections, developments, etc. visible and accessible for the first time. Through reflection and contextualization of one's own work, knowledge is lifted from practice and made explicit.

In search of a potentially fruitful perspective, the initial phase of a design-based doctorate usually involves a series of provisional theses with which doctoral candidates examine and question their own work. The group of supervising professors selects those applicants for admission to the PEP who give them a "hunch," an initial idea, a sense that the work presented is sufficiently strong and can be "condensed" into knowledge generation in the course of the doctoral program.

Another type of design-based doctorate does not look back at the candidate's own work, but uses design methods as a research method. In this case, it may well be that the research question can be clearly formulated at the outset. In the PEP, the basic condition for such an approach remains that the research interest is inextricably linked to the candidate's own work and builds on their own design practice.

In design-based doctoral studies, design is the central scientific method through which new knowledge is generated. Viewed as a knowledge-creating method, design has some special features. For example, design is always speculative and thus related to experimentation. In the sense of Boris Groys' *Particular Cases*, designs are individual cases in which general concepts and categories only emerge through an examination of their specific characteristics(Grojs 2016). The research method is therefore inductive: from the specific individual case to general statements.

A substantial part of the knowledge generated in the PEP arises from new designs developed during the doctoral program. Each new design also serves to generate new knowledge, which is reflected upon and in turn influences the next design process in a targeted, research-oriented manner. Design media (sketches, drawings, spatial representations, paintings, photographs, films, models, prototypes, diagrams, constructions, buildings, etc.) are particularly well suited as media for generating insights and making them visible in the dissertation.

3.   From Abstract to Accompanying Exposés

For admission to the PEP, applicants are required to submit a portfolio and CV, as well as a simple Abstract with accompanying visual media outlining their main interests (lines of work) and research approach, expected results, and planned methodological procedure. Based on the submitted documents, applicants are selected and invited by the PEP core group to participate in the PEP 0 admission presentation. As already described, the research approach must be based on and inextricably linked to the applicant's own design work, and the planned methodological approach must include design as a central method.

After admission to the program, practical research in the PEP is accompanied by a series of PEP stages and corresponding exposés in line with the progress of the doctoral program: Before participating in the presentations for PEP stages 1-6 described below, participants submit an exposé consisting of two pages of text plus their own visual material. These exposés represent the current status of the growing research project of the dissertation. They accompany the doctoral program with increasing depth and precision from start to finish: from an initial, intuitive idea based on the

participant's own design experience to the scientific refinement of the doctoral thesis topic and the expected results.

Through the gradual development of the exposés in the course of the doctoral program, the project becomes increasingly precise. This also means that the definition of the doctoral project is not a one-time act, but requires a longer design and maturation process. In fact, as described above, it is often the case that in the first phase of a design-based doctoral thesis, the focus and thus the entire layout of the project shifts radically several times. The formulation of the exposé should therefore not be understood as a final decision, but as an iterative and clarifying tool that accompanies the doctoral thesis. Similar to sketching when designing, the formulation of the exposé repeatedly reveals content-related, methodological, conceptual, or other deficits that imply further action. Nevertheless, it must first be formulated. It thus becomes the basis for the text section, which is developed and refined in parallel with the practical work from presentation to presentation.

There is an established structure for creating an exposé. The quality of this structure lies in the interdependence of the individual aspects, which almost inevitably leads to a convincing argument. Unlike other doctorates, some aspects of the PEP are not yet clear at the outset and only become apparent during the first year, in line with the content of the six PEP stages described below. Some of the following aspects remain speculative at the beginning of the doctoral program and may only become clear later in the process. In general, the following questions are addressed throughout the PEP:

Area of interest (What?)
- Outlines the broader subject area to which the thesis aims to contribute and justifies the author's motivation and the general relevance of the area.
- In the PEP, the subject area is inextricably linked to one's own design practice (Who?).

State of research and relevance (Why?)
- In the state of research section, you summarize the current state of knowledge in the area of interest, usually based on a summary of the relevant published literature.
- In order to demonstrate the uniqueness and relevance of the work, it is important to integrate it into the current research context. A convincing presentation of relevance places the identified research need in a larger context, referring to the context of the research and the current state of research. This presentation prevents the researchers from losing themselves in a self-referential view, which is a particular danger in design-based and artistic research.
- In *Design-Based Research*, the *Community of Practice* plays a central role: which designers are also addressing this topic in their own way.

Research gap (Why?)
- The overview of the state of research reveals one or more gaps. One of these research gaps is selected and reasons are given as to why and how your own discipline and the general public would benefit if this gap were successfully closed.
- In the PEP, you should have a clear idea of why your design practice can contribute to closing the gap. Your research must represent an original contribution.

Research questions (What?)
- The research question formulates the relevant question that doctoral candidates want to address within the identified gap. It must be possible to answer this question within the scope of a doctoral thesis. In other words, it is precise and limited. It is often helpful to ask a series of 3-5 sub-questions in addition to the main question, which already refer to corresponding parts of the methodology and the associated work packages.
- In *Design-Based Research*, research questions are linked to the particularities of your practice, to your personal mastery.

Methodology (How?)
- Developing the method also involves checking whether the research question is precise and focused enough. Only when one can describe a methodology will it become clear whether the

research question can be answered within a period of three years. The methodology describes the path you take to reach your result. It usually does not consist of a single step and a single method, but rather an interlocking of design with other methods.
- Each method must be described in a comprehensible manner—either within your own work or in citable literature—and produces a specific type of result. There are therefore suitable and unsuitable methods for specific questions. Naming a general method such as "design" is usually not precise enough. It should be described in detail why the method is chosen and how the methodological process is geared towards the expected results.
- In PEP, design is established as the central method. It is supplemented, for example, by graphic analysis of comparative projects by other architects, evaluation and analysis of literature, participant observation, interviews, and historical contextualization.

Aim (What for?)
- The development of the aim also serves to re-examine the coherence of the project. Here, the author outlines what kind of answers are expected, in what format the work could be useful to which target group, and what impact the author hopes to achieve.
- The goal of the PEP is to serve the further development and improvement of the core discipline of architecture, namely design.

Attached to the exposé are:
Schedule
- Finally, the schedule (When?) checks how and whether the individual steps formulated in the methodology interlock and are backed up by a realistic time frame.
Bibliography
- lists all relevant literature referenced in the text, thereby also making it clear that the exposé is situated within the relevant current discourse.

The exposés described here are intended for internal use in the PEP process. They do not correspond to the documents that may be required for doctoral registration by the universities participating in the PEP. Specific requirements apply there depending on the doctoral regulations. In the PEP, registration for a doctorate at one of the participating universities should take place before the PEP 2 presentation.

4.   Presentation of Practice and Writing Style

In *Design-Based Research*, design artifacts form the main part. Findings are usually represented by architectural artifacts. Design artifacts are a specific and multidimensional form of knowledge. As described above, they are singularities. As such, they require an appropriate space and a specific presentation that is not reductionist. This means that the selected projects and artifacts necessary for the topic being worked on are integrated into the design-based doctorate in the spirit of *Tacit Knowledge* in the greatest possible abundance of their sensuality and tangibility and presented accordingly. For this reason, the exhibition is an essential part of the presentations of the research work in the PEP, both in the symposiums and in the final defense. Drawings of sufficient size and quality, models and prototypes of precise execution, and all other artifacts should be presented in such a way that the specific form of knowledge of design and artifacts is conveyed. In the parts of the dissertation in which the design artifacts are reproduced, the text should be as restrained as possible in order to enable the sensory experience and perception appropriate to this form of knowledge.

The text part is of secondary importance in terms of scope. However, while we as architects are well trained to present our projects using design media, academic writing is not usually one of the skills we acquire during our studies or in practice. Therefore, it often has to be relearned. Good scientific

writing practice is a prerequisite in the PEP and must be acquired by each participant as a basis. Universities usually offer free workshops for this purpose. These are particularly recommended. The text part of the PEP is not descriptive, but, like the practice, generates knowledge. It refers to, discusses, and contextualizes aspects that are not clearly expressed in practice.

A scientific paper should be understandable and unambiguous for everyone, both specialists and laypeople. Science is not about simply communicating your point of view, but about convincing others of its relevance. In design-based doctoral studies, your own design work is made accessible and contextualized through reflection. This usually requires more than one perspective and thus more than one writing style:

Your own opinion is important, especially if you are researching as a designer. This is because your own way of designing is specific, unique, and cannot be generalized. It is based on your personal experiences in design. So, if you work intuitively when designing, based on your specific experience, and make decisions that do not necessarily have to be made that way, you should indicate this. This may require taking the first-person perspective (e.g., "In the next step, I intuitively made sketches in which I developed variations for possible designs").

In contrast, reflection and contextualization are best achieved using the classic scientific writing style in the third person, which strives for objectivity ("Considering the positions of A. and C., one interpretation emerges..."). It is essential that the authorship of the thoughts and decisions described does not remain opaque. Passive phrasing carries the risk of making the design process appear passive, without individual decisions.

The following points should be taken into account for subjective writing style:
- Do not write anecdotally, but rationally.
- Share the relevant facts, even if they seem unscientific, i.e., if they cannot (yet) provide reasons for certain decisions made during the design process.

The following guidelines can be used for an objective writing style:
- Be sober and factual; do not write in a feature-like style, do not use colloquial expressions, and do not write in the first person.
- Write an argument based on comprehensible arguments with evidence (facts, proof, logic, interpretations).
- Write a well-founded argumentation, not postulates, political ideologies, or uncritically established value systems.
- Be as clear and simple as possible; do not use unnecessarily complicated sentences.
- Explain key terms and the meaning in which you use them.

Cut out repetitions, redundancies, and irrelevancies! A paper is not finished when there is nothing more to add, but when there is nothing more to take away.

5.   Working with Sources

Basics
- Scientific work is about producing new knowledge independently. For this reason, quotations are usually integrated into an argument and do not stand alone without comment. It should be clear how you understand the quotation and why the expertise of the authors quoted is relevant to the topic at hand. Authors are cited in the text ("While A. argues that..."), especially in direct quotations ("As early as 1765, B. wrote: "..."").
- In the case of lesser-known authors, the relevant expertise is also mentioned. (Example: "The architect and architectural theorist NN takes the position...")

- All direct and indirect quotations from external AND your own texts must be identified as such. Failure to do so constitutes plagiarism. Good academic practice also requires that ideas, concepts, and similar elements that you develop in conversation or in response to, for example, a lecture, must also be referenced accordingly.
- Arguments and theses of another author that are reproduced in your own words in the text are usually written in indirect speech or otherwise clearly marked as the opinion of the cited authors ("C. concludes from this that..."). It often helps to differentiate between the reproduction of content and the authors' theses ("The author describes the turning points as... In her opinion, these are responsible for...").
- When you express an opinion or criticize an author, always consider what objections could be raised against your position or how the criticized author might respond. Explain the objections and refute them. It is part of your job to show that you can put yourself in the position of the person you are criticizing.
- Remain fair in the discussion and do not attribute opinions to authors that they do not actually hold. It helps to ask yourself:
  o What is the authors' most important thesis?
  o What assumptions are they basing their argument on?
  o How do the authors get from their assumptions to their thesis?
- If important aspects of a position are unclear, discuss different possible interpretations and choose the one that best matches the author's other opinions and makes their argument appear strongest.

Citation Style and Bibliography

In order to reference the ideas of other authors correctly, clear references are inserted at the appropriate place in the text or in the footnotes, depending on the citation style. The most important goal here is to enable your readers to find the citations as quickly as possible using the information provided. To do this, use a single, consistent citation style throughout your work. The established citation styles (e.g., the _Chicago Manual of Style_ used here) regulate the type, formatting, order, and details of the bibliographic references for 99% of all cases. This applies to how a source reference is formatted in the running text or in the footnote, as well as how it is indicated in the bibliography. In PEP, Chicago has proven to be a particularly suitable citation style.

Citation styles are automatically applied by reference management software. You will save yourself a lot of work if you use it from the beginning (e.g., _Zotero_ (free), _Citavi_ (often licensed through the university)). The information that your reference management program pulls from the internet should always be checked.

In the bibliography at the end of your paper, you should provide the full details of the sources used (and ONLY those used and referenced in the text). Different citation methods apply to monographs, papers, contributions to anthologies, websites, interviews, etc. It is always important that the source is directly attributed to an author. This means, for example, that in an anthology you do not reference the editors, but the authors of the contribution cited in the book. It is also inaccurate to refer only to an entire book when citing specific references. As a rule, you should refer to the relevant pages in the book or paper where the literal quotation or referenced idea can be found. Finally, it is generally accepted that only published material that is of sufficient quality to be cited as a source should be quoted. It is also considered good scientific practice to refer primarily to primary sources rather than secondary literature.

Illustrations and List of Figures

In architecture and art, image citations are a particularly difficult topic. In general, illustrations may be cited for scientific purposes. However, they must then be unavoidable for a step in the argumentation. The case law on this is complex.

In the case of architectural photographs, there are usually several authors who must all be named: the architect and the photographer. Both the building and the photo are protected (artistic) works.

Illustrations must be clearly numbered. They are given a number and a unique caption in the text ("Fig. 14: *Edith Farnsworth House* at night"). In the list of illustrations, the following information is provided under the number of the illustration: image content (e.g., building, part of the building, architect, year of construction, location), author (photographer), original title of the photograph, year the photograph was taken, and the location where the image was taken (website, book, magazine, etc.), again with comprehensive source information. For the images you use, especially for the use of images from co-authorship or dependent employment relationships, you should clarify at an early stage whether you have the right to publish them. This will help you avoid disputes at the end or when publishing your work, which could be fundamental and jeopardize your entire doctorate.

6. Structure of the Dissertation

The aim of a doctorate is to generate knowledge and share the knowledge generated. For this reason, the structure of a dissertation is usually geared towards the reader and endeavors to explain the knowledge acquired in a way that is easy to understand and clear. The structure and weighting of the work are developed with the supervisors during the course of the doctoral program. The simplest structure for this is: introduction, main section, conclusion. The following guidelines may be helpful for this.

Introduction, approx. 20%
The introduction contains a brief description of the preliminary work: your own design projects and projects as the basis for the thesis and, related to this, your personal motivation for the present research. You describe the guiding interest embodied in your projects and how the doctoral thesis topic and its relevance are derived from this. You then classify the research project within its knowledge community and contextualize it. Finally, you briefly summarize the content of the thesis in advance (state of research, gap, research question, structure of the thesis and method, results).

Main Section, approx. 70%
The main section is the core of knowledge production. It contains all the fundamentals, arguments, artifacts, and development processes in a comprehensible manner. The aim of this section is to make a new and relevant contribution to the existing state of knowledge and to clearly explain what this contribution consists of.
In the PEP, the examination of the doctoral thesis topic in retrospect of one's own work, but especially through new design projects created during the doctoral program, contributes the essential part of the work. The projects are comprehensively documented and reflected upon. The results are compared with related positions in the discourse in theory and practice, and the differences and the special contribution of one's own work to the current state of the discourse are clearly elaborated.
The structure of the main part follows the research question. As a rule, it contains and discusses the relevant fundamentals (and only these) that are necessary to be able to argue soundly on one's own topic (e.g., historical developments, current state of research), as well as all important steps in the thought process for answering the question. The main part should be divided into several chapters with meaningful headings.

Conclusion, approx. 10%
The conclusion summarizes the main steps of the argumentation and the results/findings from it in retrospect. In it, you critically discuss the relevance of the findings and formulate an outlook on further questions and future research needs.

Appendix
The appendix contains everything that would unnecessarily interrupt the flow of the argumentation when reading, but is indispensable to the core of knowledge production (full-length interviews, detailed additional explanations, series of images, etc.). The appendix is a good way to keep the main part as compact as possible.

Bibliography and List of Figures
As already described above under *Working with Sources*

7.   Sequence of the 6 PEP Stages and Presentations

PEP 0: Presentation for admission to PEP

PEP 1: Design projects, main interest, outline of the research topic and associated methodological approach
Doctoral candidates present a condensation of the topic derived from their own design practice. An in-depth analysis should show how and which new design projects are used to answer the research question. Initial criteria for investigating the research question are developed.
Starting with PEP 1, the submission of an exposé to the symposium accompanies the PEP process: two pages of text (800-1200 words) + own visual material.

PEP 2: Highlighting the research question through old and new design projects
New design projects contribute to the clarification of the research topic. Reflections on the new projects sharpen the argumentation and form the basis for the research questions that will be investigated in the next design projects.
At the latest before the presentation for PEP 2, doctoral candidates are required to register their doctoral project at the respective university and enroll. Registration is a prerequisite for participation in further PEP presentations. The registration procedures are regulated in the respective doctoral regulations.

PEP 3: Refining the argumentation through old and new projects and initial comparison of the findings on the research topic with existing knowledge – contextualization of draft research
New design projects contribute to clarifying the research question. Reflections on the new projects and initial comparisons of the findings on the research topic with existing knowledge sharpen the argumentation and place the doctoral thesis in the context of the respective knowledge community. Contextualization of the research.

PEP 4: Further refinement of the argumentation through old and new design projects and in-depth comparisons of the results found on the research topic with existing knowledge bases, draft of a structured presentation of the entire investigation
Further design projects follow. In-depth analysis and reflection on the proejcts in comparison with existing knowledge, the current state of research, and the relevant *Community of Practice*.
Sharpening of one's own results and presentation of the application of previous findings in one's own design process. In preparation for the presentation on PEP 5, a structured presentation of the entire study in the form of an outline should be prepared.

PEP 5: Presentation of the entire study as a milestone presentation
Candidates must obtain approval for the completion of their doctoral project. This is done through the milestone presentation as part of the presentation for PEP 5. It is necessary to present approximately 75% of the doctoral project. The following structure must be adhered to:

1. Preliminary work by one's own design projects
2. Developing the doctoral thesis topic = research question
3. Examination of the doctoral thesis topic through design projects created in the doctoral project and reflection on the projects with the clarification of the research question.
4. Comparison of the results with related positions in the discourse in theory and practice

The core group of PEP professors grants approval for further processing to conclude (green light), recommends revision (yellow light), or decides that the milestone presentation must be repeated (red light). If the green light is not given after the milestone presentation has been repeated, the candidate is advised to discontinue the doctoral project within the PEP and no further supervision is possible within the PEP. The recommendation is made as a joint vote by the core group of the PEP. In the event of a differing assessment, a simple majority of the individual votes counts.

This recommendation does not affect the possibility of submitting the work for review in accordance with the respective doctoral regulations of the participating universities. This then takes place outside the PEP. This decision is up to the candidates.

PEP 6: Completion of the doctorate and trial exhibition
At the presentation for PEP 6, the research work is essentially complete and has undergone an initial plagiarism check, which must be submitted by the candidates. PEP stage 6 presents the entire research project and proposes a concrete exhibition concept, which is set up on a trial basis. It shows how the written part of the work is combined with the practice-based part of the exhibition to form a holistic statement. The final PEP presentation serves as a dress rehearsal for the academic discussion. For this presentation, the written part of the dissertation can be submitted to the respective reviewers before the final work is officially submitted by the candidates to the respective faculty. The trial exhibition should be documented and incorporated into the dissertation.

8. Submission, Academic Discussion, Publication

Submission
Since the text part of the design-based doctorate in the PEP is subordinate to the practice-based knowledge generation through design, as described above, it should not exceed a maximum of 80 pages (24,000-40,000 words). This does not include figures and illustrations.
Familiarize yourself in good time with the respective dissertation regulations of the faculty and university at which you are enrolled for your doctorate. There may be specific differences in the general requirements for a doctorate and in the doctoral procedure. Assume that no further changes are possible once you have officially submitted your thesis. This means
- Check your citations, footnotes, and references beforehand.
- Perform a final plagiarism check using appropriate software (this may be provided by the university and is also used by examination and doctoral committees to review the thesis).
- Clarify all rights and image rights before submission (have the use of the rights confirmed in writing). Since a doctoral thesis is an academic work, the rights are usually easy to obtain.
- Have your work proofread for grammar and spelling.

Scientific presentation including an exhibition
The academic discussion or defense is subject to the requirements of the respective doctoral regulations. In addition, the PEP requires the academic discussion to be combined with a publicly accessible exhibition that includes the preliminary work and those design results that have made significant contributions to the acquisition of knowledge. The exhibition must include all designs and artifacts relevant to the doctoral thesis topic that were created as part of the doctoral project and that demonstrate the design-based development of the work.

To ensure readability and comparability, each exhibition must include a paper presentation comprising at least 20 DIN A1 sheets. Other formats refer to the specified area requirement, e.g., 10 x DIN A0, 40 x DIN A2. Models and design artifacts are expressly desired and are generally required. All other media and supplementary exhibition components may be used. Depending on the specific characteristics of the doctoral project, deviations from this requirement may be permitted in individual cases upon consultation.

Final publication of the doctoral thesis
The publication requirement, which is regulated in the doctoral regulations, covers both the reflective-textual and the design-based, practice-oriented parts of the thesis.

9.   Bibliography

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