Inquiry-Based Learning in Design

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The University of Applied Sciences FH Potsdam is known for its wide-ranging design education: Product and communications designers have been trained here since 1992, interface designers since 2003. In order to highlight the potentials as well as the difficulties and limitations of inquiry-based learning in the discipline of design, several design professors from the department who had already implemented inquiry-based learning in their teaching practice were invited to a discussion in August of 2015:

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22.1 Scientific Research in Design

Mieg: What role does scientific research play in design?

Heidmann: There is art and there is art studies; there is media and there is media studies; thus there is design and design studies, too. Design studies is basic research that deals with the history, theory and perception of design. The concept of *research about design* was established based on the work of Christopher Frayling (1994). This must be distinguished from *research for design*, the results of which include new design methods and processes, for example, as well as the knowledge transfer of other disciplines (e.g. cognitive sciences, information technology, material sciences) for design. The third and most difficult-to-grasp category, *research through design*, expresses that an artifact itself is the embodiment/materialization of research and generates new knowledge. In this way, the "state of the research" is not just conveyed verbally, but graphically as well. Design may thus become a third class of research. It is *a "science of applied, everyday problem-solving."* This opportunistically utilizes the method sets of other disciplines, for example of ethnology.

Godau: In the case of a new discipline, it is an inevitable development that, initially, methodological use be made of other disciplines. In design, we do not have a unified "textbook" that sets forth design methods that can be used in a precise manner. At best, the educational model at the Ulm School of Design (HfG Ulm), which conceives of design as a social and not as a formal task, could be considered to some extent as such. According to the philosophy of the HfG Ulm, products should be developed based on their purpose. HfG Ulm was founded back in 1953 and dissolved 15 years later; since that time, a lot has changed in the field of design.

Langer: Naturally many methods have been adapted and introduced from other disciplines, the reason for which is that designers are interested in bigger problems and *want to "save the world."* Nevertheless, design also has its own research methods – these are simply not summarized in a single compendium. Designers have always worked with variant formation after changing the practical variables, for example. This is a typical design method that has not been "stolen."

Beyrow: I believe that design studies will never be a science that produces definitive answers (*Bescheidwissenschaft*), but rather a *supporting science* (*Begleitwissenschaft*). That means that design studies will never claim to fundamentally alter other reference disciplines, since it can only partially "find its way around" in those disciplines. It can provide suggestions for the restructuring of these disciplines and contextualize existing specialist knowledge, however. Nevertheless, design studies will never take on the role of appointed evaluating authority. But we can hope that we will eventually be able to develop an intellectually supportive instrument.

Wettach: I believe that design has contributed much to the social canon of knowledge. An example of this is how early graphic design in the 1990s changed people's viewing habits with the advent of the Mac. We are happy to be inspired by methods, but in the meantime, this evolution also has a repercussion on other disciplines that *we* inspire. For example, the designers Bill Gaver, Tony Dunne and Elena Pacenti developed the technique of "cultural probes," in which data about users' thoughts, feelings and values can be collected with the aid of small artifacts. This is a qualitative method that has since been adopted in sociology.

Godau: If design is an academic field of study, then it is a hybrid, because we have both a technological approach and an individual-intuitive art approach. And, in any case, we also have a humanities approach. Design studies is still growing, however. When sociology, along with other academic disciplines, first saw the light of day, it had the exact same problem. This also happened to psychology, which was decried as "dream interpretation." Historically, I see it as a structural process that is always the first step on the way to becoming a discipline.

Heidmann: I believe that design does not fit into the canon of the human, natural, technological and engineering sciences. These categories of science develop their state of the research through the verification and falsification of hypotheses. Transferring these to design would also mean having to evaluate the results of the design process. Designers would find this difficult.

Beyrow: I would describe this as a fear of allowing a different scale. We feel at home in the taste we have elaborated and in our assessment; that's worth a lot. After all, we would not be able to use scientific methods to relieve a user of making any design decisions. Therefore I would say that design is a kind of *navigator*: We must try to make very complex connections understandable and visible so that the client or other designers are able to follow and participate in the discussion. Accordingly, we are the ones who also develop solutions to these problems. The navigator may be a type that is not easily represented in other sciences. This also means that we need to create access to and an understanding of other industries if we are to develop appropriate solutions for them.

Heidmann: Bruno Latour (2009) stated that it is designers who can "save the world" – if anyone can. Design is very social because it seeks to solve worldly problems, and it rarely operates in a void. Latour described five quality criteria of design that bestow on it the privilege of assuming this role of problem-solver:

1. humility and modesty towards "fundamental" disciplines such as engineering, architecture;
2. attention to detail;
3. the possibility of opening up artifacts to interpretation and giving them meaning;
4. the property of design as a subsequent task that always builds on something that already exists;
5. the introduction of morality, which is the basis for evaluating how "good" a design is.

This makes it clear that designers can withdraw and be empathetic. And since they try harder to generate solutions, they have a more playful approach than other sciences. That is exactly what we need in the twenty-first century. It is a discipline that covers everything. That can also be a strength. In the approach to "design science" within the philosophy of science, the fact that design is *not subject to the traditional understanding of science* is regarded as a strength. Classical science is one path to knowledge; design is another. It is the opposite of an experiment; the results are not generalizable.

Beyrow: Design as a discipline is also about acting from another level – in contrast to occupations and job profiles that are more oriented towards the skilled crafts and trades (such as media design). The thing is: is it necessary? Is "good craftsmanship" not enough?

Heidmann: But what about scientific verifiability? When I use an "eye tracker" (a device that records a person's eye movements) to examine a newly designed logo, I can confirm or refute the design hypothesis of the designer. If we want to view design as more than a skilled craft and trade, we have to let that happen. Finally, whether a logo is well received by the recipient can be empirically operationalized.

Langer: Eye tracking and other methods of evaluation do not necessarily just scare designers because these methods can falsify something, but because they were not used to it in their design education. In design education, the state of the research has always been determined by the verbal discourse. Written discourse – in other words publishing, responding to one another in writing and therefore making the discourse a resource that can be consulted – is something that scarcely exists. That's why we still have small groups in design. It is now time for designers to pay attention to it.

Godau: I find it good to evaluate a new design using eye tracking or other methods. This is the case with marketing methods as well, however: you can only ever represent what is. There is also the principle of habituation, which cannot be foreseen. A new aesthetic when launching a product may initially be met with displeasure and it may take users a while to adopt that aesthetic.

22.2 Inquiry-Based Learning in Design

Mieg: And what does that mean as a consequence for inquiry-based learning?

Godau: I would like to make a distinction between research and inquiry-based learning. For me, in the case of inquiry-based learning, an orientation towards design pedagogy is the priority. And my thesis would be that the question of what inquiry-based learning is in design is premature, because we have no design pedagogy.

Heidmann: My concept of inquiry-based learning is very opportunistic. I simply draw on various methods. Integrating current research findings into one's teaching goes along with inquiry-based learning. Ludwig Huber (2009) calls for *going through the entire research process,* for example – in other words, defining questions and delimiting these again – and this has a lot to do with the normal design process. It's also about delimiting, gathering knowledge, designing something. But at the end of the design process, what you have is an artifact and not a scholarly paper. This is a different output, but the basic process is not dissimilar in research and design studies (Heidmann et al. 2011), especially in the later semesters.

Wettach: I would like to develop a slightly different position straightaway, one that I realize is also becoming more and more important in practice: For me, the *scholarly paper is in the foreground* in the course. I use it as a common thread that runs throughout the course. In this sense, the paper is not documentation that is written at the end of the course, but ideally, I use its structure to establish inquiry-based learning instead. It is therefore used to provide students with written reasoning.

Langer: In principle, inquiry-based learning is about first finding the right question. This is also integrated in the design discipline right from the start: Students must tolerate uncertainties in order to find a topic that is interesting and relevant to them. This is a very painful process, as it is often only then that they realize how interesting a subject is. In design education, some instructors keep students in limbo for a long time. In inquiry-based learning, the focus is also often heavily placed on this "*leaving in limbo.*" For design, that is almost boring, since that is already the practice there. There, the question is more about how to narrow the matter down again. The literature on inquiry-based learning shifts the focus to project work, away from lectures. But design actually needs to move further away from project work and back to various distinguishable formats.

Beyrow: My reaction to inquiry-based learning was that I no longer defined tasks but instead defined problems, for example "Here is a baker who wants to sell more bread rolls." As a designer I have to think about which tools I can use and which are the correct tools for this specific baker. What is a challenge here is that we cannot initially work in a way that is solution-oriented, but have to open up the problem area first. This will be very disorganized and confusing at first, and it will be necessary to condense it once again in the middle of the semester. In other words, inquiry-based learning also means putting the artist *in a state of surprise*, because they discover everything that a topic may entail. I try to establish simply finding a topic as training for students. As a faculty member, however, I must make a point of eventually requiring actual designs. For me, these are two separate processes.

Heidmann: Naturally, research thrives on the fact that one very often fails and experiences disappointments. This is hard for design students, because you want to have a great product in the end. Feedback can then have a very demotivating effect. Take the example from Matthias Beyrow: If it turns out that people no longer buy bread at the bakery because they've discovered that grain is unhealthy, then that's not a design issue. But as a teacher, you would not say that. And Reto Wettach requires immediate designs in his course, for example, which is something we also disagree on. Admitting that something does not work in research is also part of the early stages of a research process. *Dealing with failure*

is unpleasant in other research disciplines as well, but it is especially true in the design disciplines. This also means admitting this to students and not requiring ten posters for an exhibition at the end, for example. We in design would have to deal with these demands somewhat differently in courses that focus on inquiry-based learning.

Wettach: Work done for the bachelor's degree should show that students can apply designs, while work done for the master's degree should also represent a contribution to other designers. In this context we do a lot for the development of methods and tools, for example both in the area of prototype tools and also in the development of new interaction paradigms.

Heidmann: What has proven itself: Doctoral students are especially capable of practicing inquiry-based teaching, since they can also do research in teaching. Unfortunately, at FH Potsdam, we can only hire doctoral students through third-party funded projects. However, inquiry-based learning should not only be made a topic in projects with a limited time-scope, but needs to be continuously and constantly anchored in teaching practice in higher education. Therefore, it is our job as professors to advance and implement inquiry-based learning.

22.3 Advantages of Inquiry-Based Learning for Students

Mieg: How do students benefit from participating in inquiry-based learning?

Godau: Inquiry-based learning is good for opening your own horizons and asking yourself what current topics are. Students are forced to look for questions themselves, which better prepares them for their future.

Beyrow: Students benefit from the fact that they have a different kind of insight when they ask these research questions. We have to make them understand that you cannot "just do it like that." We want to develop concepts and not just act by following formulas. And when you internalize that, you have to ask questions and be able to tolerate the fact that there are 24 equally exciting and good solutions in the class. We do not work towards a universal solution, but instead work using very different approaches, all of which could work, because all can present good arguments.

Langer: And students should understand what citation means, but also that there is a difference between tasks that are aimed at writing a 20-page paper or at developing a design project. And of course that looks different.

Heidmann: Of course, it is also about showing the students an alternative career path to the design firm/agency. The majority of them want to study design in order to create a portfolio or to develop an app, for example, than make a small contribution to developing methods for measuring attractiveness.

Langer: This is the strength of the university as an educational facility that it is able to show this variance in professional careers. That means that we have to educate people who can weigh these and make their decisions on that basis.

Beyrow: We are working on a new type of designer here, partly because we have learned it differently ourselves and want it to be different. In their professional futures, students

will also always have to deal with the products of research. This requires intellectual analysis, a strategy that we teach with inquiry-based learning.

Langer: Writing a paper can also advance a design portfolio in a completely different way and set it apart from others. Ultimately, it is always about creating a transfer benefit to other disciplines.

Wettach: I notice this a lot in my practical work with designers who sometimes have great difficulty defending their designs argumentatively. In the case of a presentation, a layperson must be able to decide for themselves whether the design is good or not, or must be provided with a rationale for why it is a good solution.

Beyrow: Correct. Perhaps we can provide designers with the capability to communicate better with inquiry-based learning. In other words, not to say: "This is great because I made it," but instead to lay out reasons and approaches as is done in modern art as well.

22.4 Outlook for Inquiry-Based Learning in Design

Mieg: What is your outlook on, and what are your wishes for, inquiry-based learning in design?

Heidmann: Since the founding of our design program, it has been reflected time and time again in the evaluations that we have a theory and method deficit. There are many reasons for this: We do not coordinate enough, we interpret our modules very freely, there is not one documented state of the research. In their primary studies (*Hauptstudium*), students have comparatively little theoretical knowledge. Although their approaches are intuitively correct and they can design and program, there is nevertheless a lack of factual and methodological knowledge. We need to work on that.

Wettach: I'm surprised how quickly students forget. I also think that we are no longer up-to-date with our evaluation methods, especially when it comes to the qualitative area. I would like for us to do more in the area of cultural probes, for example. Out of the lab, into real life!

Godau: In the course, "Das große Wie. Forschungsmethoden im Design" ("The big How. Research methods in design"), which I designed with Harald A. Mieg, a student raised an interesting question: "Why do we still design for old needs instead of deliberately influencing them?" And I think that is something where inquiry-based learning can help us to think independently about how to influence; not in the sense of "saving the world," but exploring the possibilities and limitations of working as a designer.

Beyrow: I have had the experience of doing research with students on the topic of university logos – it was absolutely impossible. Students were unable to research, analyze and present ten university logos per person. Scholarly research is one of the basic competencies that we should teach as an institute of higher learning, however. This must be approached with new teaching formats. If 10–20% of the courses that we offer are not decidedly design-focused, but instead focus on research results, then inquiry-based learning will also be more wisely accepted.

Langer: The range of possibilities is what is so exciting: getting to the bottom of research questions, but also sometimes making arbitrary/intuitive suggestions. We should also show this range of possibilities to students as approaches (Box 22.1). For me, inquiry-based learning is not a means to confirm what we are already doing, but to try something new.

Box 22.1: Student Interaction Design Research Conference – A Conference for Students by Students (Jacob Buur)

The faculty at the University of Southern Denmark trains students in publishing papers on their own IT Product Design graduate program is positioned between a design school tradition of studio-based learning in active projects, and a university tradition of theoretical basis and scientific argumentation. From the inception of the program in 2001, professor Jacob Buur and colleagues were intent on teaching students to conduct their own research, as the field of interaction design is evolving so rapidly that methods learned 1 year may be obsolete a few years later. One means of achieving this was to challenge students to develop their skills in scientific work: Oral exams turned into research seminars; Projects were completed with a research report in conference paper format.

This led to the need for a venue where students could present their work in a broader community, not just to professors and clients. So in 2005, the University of Denmark established the Student Interaction Design Research Conference (SIDeR), which has been run every year since, in universities and design schools across Scandinavia and The Netherlands, with some 100+ participants. What makes the conference special is that it is organized by students for students. Students submit their papers to double-blind review by junior researchers and faculty; they present, discuss, and organize workshops as in a regular conference. Over time, the standard of student papers has improved as other programs started adapting similar teaching principles. Today, the students don't stop at SIDeR: they submit papers to a range of regular and high-level conferences in the design community – and are often accepted.

What do the students write about? The IT Product Design program is both international and cross-disciplinary, and accepts students with a background in design, engineering, business, anthropology, or communication. Therefore, they also address a wide range of themes and employ diverse research methods; these include: Design ethnographic research (to understand human practices and the role of technologies), research through design (to investigate concepts by building, to critique prevailing perceptions in society), action research (to develop new design methods and practices in organizations), and conversation analysis (to understand how people interact with each other and with designed objects).

Since the early years of SIDeR the focus on research in learning has trickled down to the undergraduate design classes, so that those students have also begun writing up their own research experiments, and several of them get papers accepted at the conference each year.

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