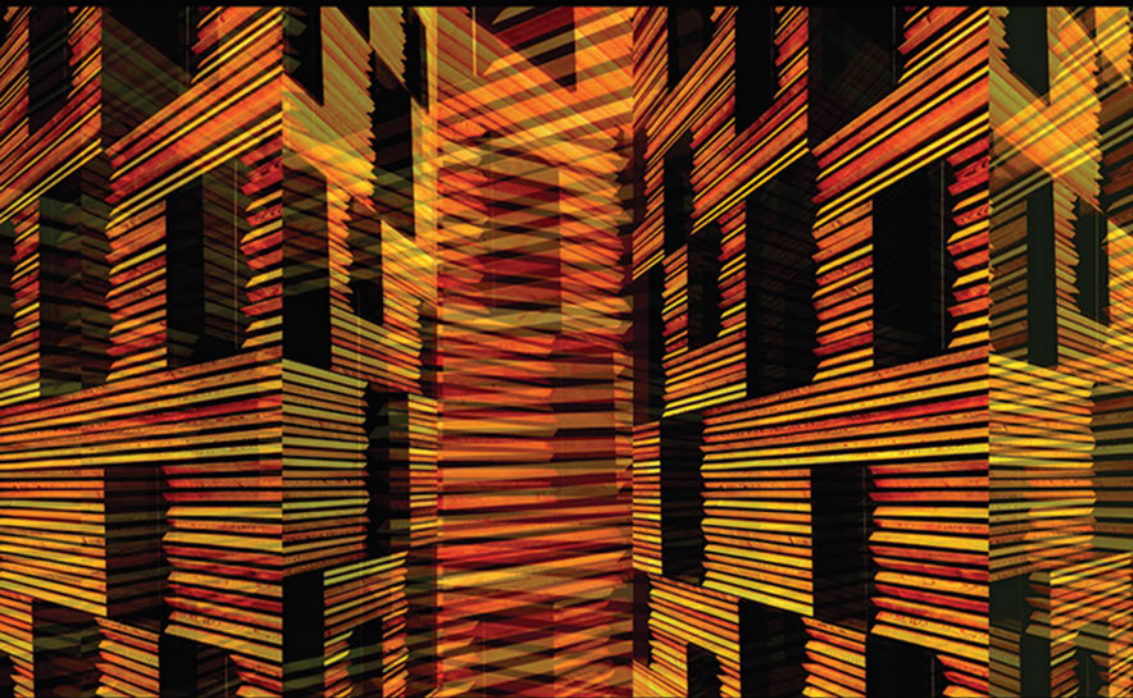


# Digital Didactical Designs

Teaching and Learning in CrossActionSpaces



ISA JAHNKE

# DIGITAL DIDACTICAL DESIGNS

As web-enabled mobile technologies become increasingly integrated into formal learning environments, the fields of education and ICT (information and communication technology) are merging to create a new kind of classroom: CrossActionSpaces. Grounding its exploration of these co-located communication spaces in global empirical research, *Digital Didactical Designs* facilitates the development of teachers into collaborative designers and evaluators of technology-driven teaching and learning experiences—learning through reflective making. The Digital Didactical Design model promotes deep learning expeditions with a framework that encourages teachers and researchers to study, explore, and analyze the applied designs-in-practice. The book presents critical views of contemporary education, theories of socio-technical systems and behavior patterns, and concludes with a look into the conceptual and practical prototypes that might emerge in schools and universities in the near future.

**Isa Jahnke** is Director of Research for the Information Experience Lab and Associate Professor of Information Science and Learning Technologies at the University of Missouri, USA. She was Professor of ICT, Media and Learning at Umeå University, Sweden, and Assistant Professor at TU Dortmund University, Germany.

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# DIGITAL DIDACTICAL DESIGNS

Teaching and Learning in  
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*Isa Jahnke*

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# PREFACE

*For 10 years we have had the same problems:  
ICT is not integrated enough in education.*

(A teacher at a conference in Norway, Oct. 2013)

There is a shift away from the separation of digital media and education towards co-expanded settings where mobile technology becomes part of the classroom; both merge into new communication spaces. This situation affects teaching and learning in different ways. The research I have performed in recent years makes a contribution toward research-based teaching practices and student learning in such emerging multiexisting communication settings—technology-enhanced designs for learning and tablet-mediated designs for learning.

Since starting as a researcher in this field in 2001, I have seen change in technologies. We went from almost no Internet in the 1980s to Web 1.0 in the 1990s; now we work with Web 2.0, Industrial Revolution 4.0 and the Internet of Things. The guiding questions have always been the same: To what extent is it possible to support learning by interactive technologies, and what kind of learning quality does teaching support with interactive media? What are the potentials for teaching and learning with web-enabled technology that is not possible without? “How do you know that students are learning and have learned?” A simple question by Thomas Reeves (2006) that I put it on the table once again for discussion. I intend to bring these issues of *teaching, learning, quality and design* together and take them to the next level: what *is* learning in the era of a digital networked world, when access to information poses no difficulty whatsoever?

The main assumption of the book is that it is not information design or content that need our attention. Designs for teaching and learning, which use materials and content, require both detailed reflection and a cultural change. This perspective, and the activities it embodies, is called Digital Didactical Design.

Not wishing to disappoint the reader, I will be clear at the outset in saying that I do not have all the answers to the questions that this perspective poses—indeed, I pose many new ones myself. Asking the right questions takes us halfway toward designing the future, and it is my hope that these questions may be useful when reflecting on our current understanding of education, teaching and learning.

The book could have borne many subtitles, each of them quite different, and it was not easy to choose only one of them. An alternative option to the one that I have chosen is *Learning Expeditions in Arena X* (Jahnke & Norberg, 2013). This stresses the unknown situation of higher education in the future. Instead of focusing too much on new technology-driven designs or content design, the challenge is to develop Digital Didactical Design so as to enable meaningful and deep learning.

Actors in educational settings such as teachers, designers, educational developers, researchers and policy makers, but also learners themselves, can easily restrict learning; but do we know how to support learning in order to help learners to grow in their learning progress? The enablement of learning, and creating opportunities for learning, are at the heart of this book. The challenge is to design learning in educational institutions where not only ICT-supported resources are at the center of teaching but also new forms of Digital Didactical Design, which unfold an evolution toward a diversity of learning expeditions.

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Over the last few years, I met researchers from different countries and together we walked partly similar trajectories, we discussed and reflected about Mobile Learning (is learning mobile or wearable?), Educational Technology, CSCL at the Workplace, and I hope we continue working together; in particular, I thank Swapna Kumar (University of Florida, USA), Sean P. Goggins (University of Missouri—thanks a lot for co-chairing ACM Group '14 with me; wow, that was awesome!) and Julia Liebscher (Duisburg-Essen, Germany).

In this book, I refer to some of our research projects such as InPUD, DaVinci, PeTEX and Digital-Didactics. The success of these projects refers to a

## **xiv** Acknowledgments

team—research is teamwork. In InPUD (2001–2010), I collaborated with Volker Mattick and Hans Decker (both TU Dortmund, Germany). Thank you for making InPUD rich of experiences. DaVinci (2008–2011) would not be successful without Tobias Haertel (TU Dortmund, Germany). Thank you Tobias for your multi-perspective thinking and pluralism! The project was funded by the German Ministry of Education (BMBF). PeTEX (2009–2011) was a European project (in the Lifelong Learning Programme) and its success was driven by Claudius Terkowsky, Christian Pleul, and A. Erman Tekkaya (TU Dortmund, Germany). Many thanks go to the teams at Palermo University (Italy) and KTH/Stockholm (Sweden). It was a pleasure working with you.

For three years, from January 2012 to the end of 2014, we studied tablet-classrooms in Denmark. It is an amazing 1:1 media-tablet-program and school project in the municipality of Odder. Dear Lise Gammelby in Odder, thank you so much for opening the doors for us and “Tusen Tack” (many thanks) to all teachers who do a great job of designing for learning. Thank you very much that you let us in and become a part of your tablet-classrooms. I also want to thank the head-masters and all teachers in Sweden, Finland and Norway that open their classroom doors for us researchers. The Swedish project was funded by the Swedish Research Council (Vetenskapsrådet), 2014–2016. Thanks to Marko Kuuskorpi for inviting us to Kaarina (Finland) and thanks to Erling Gronlund for inviting us to Oslo (Norway) – tablet-classrooms integrated into the curriculum on the move! In 2012, I visited the P.K. Yonge Developmental Research School at the University of Florida. Thanks go to Julie Henderson and Swapna Kumar for creating this great opportunity.

My research is also inspired by my colleagues when I was a PhD student and later a post-doc researcher at IAW-IMTM, Ruhr-University of Bochum (until 2008), especially, I am grateful and want to thank deeply, Kai-Uwe Loser (our discussion on Anti-social Media) and Gabriele Kunau (for her crucial reflections on Sociotechnical Systems) – I liked very much (although sometimes exhausting) our Luhmann readings in the evenings; thanks go to Rainer Skrotzki for his nice humor useful to reflect on existing routines. Thanks to the IAW-IMTM team!

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Isa Jahnke

March 2015, Umeå, Sweden



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# 1

## INTRODUCTION

### The Internet in Our Pockets and Handbags; ICT Is More Than Just a Tool

*I went to a highly ranked college where all the professors came from excellent universities. . . .  
But all they did was read from their textbooks. Then, I quit.*

(M. Prensky, 2001, p. 3)

In the era of web-enabled mobile technology, one factor has changed that has enormous impact on our current understanding and definitions of the nature of teaching and learning in education. It has an effect on how schools and universities, teachers, students and decision makers approach teaching and learning. This changing factor is ubiquitous access to information through mobile devices and wearable technology (e.g., media tablets, smart glasses). It is the omnipresence of online presence, independent of where we are. More people have better access to information with easy-to-use mobile devices, anytime and anywhere; we potentially have all information always at hand via our media tablets or web-enabled phones. Such a simple-sounding development has tremendous impacts on learning. Whether we like it or not, mobile technology has already affected the way we learn: discussions and learning strategies have changed. If the learner does not know about Subject X, she merely has to search for it online, instantly. In the digital age—in an Internet-driven, networked world—constant online access supports the Homo Interneticus in searching immediately for solutions to a question or a problem. This technology-mediated social action takes place as an individual person or as the individual engages in contact with her groups and learns in collaboration.

Unlike informal learning outside educational institutions, traditionally Information and Communication Technology (ICT) was segregated from the normal teaching classroom, for example, in computer labs (Henderson & Yeow, 2012). This has changed with the advent of smaller, flexible devices. Differences between

## 2 Introduction

laptops and small, easy-to-handle multimodal Web-enabled devices are discussed in other literature (e.g., Johnson et al., 2013). There is a shift from separating ICT and education to co-located settings (De Chiara et al., 2007) where mobile technology becomes part of the classrooms; both the offline and online worlds have merged into new forms of co-located communication spaces. These new spaces are the expansion of the traditional classroom boundaries—in short, CrossActionSpaces.

CrossActionSpaces provide various offline and online ‘rooms’ for social interaction and communication within one physical location at the same time. For example, imagine a lecture hall with 100 students in the traditional setting, where the teacher asks an open question; only one student is able to answer at any one moment. With mobile technology, all students are able to contribute and become active agents—it is the expansion of the established communication space. Traditionally, communication was limited to the physical lecture hall, and only those people that were part of the physical room could interact. With web-enabled technology, learners can consult their online networks, such as social networking sites and micromessaging services (e.g., Twitter, LinkedIn) for different reasons. Some want to find an answer to a question or solution; others want to engage in discussions about the lecture content. Such cross-actions of learners expand the given physical room to many spaces. It is the extension from those who attend in the physical location to new and other participants elsewhere. These spaces are connected to other spaces. The learner in the lecture hall and classroom interacts with her networks and these members have access to other networks, and so on.

A person is in a physical place but at the same time in two or several other online spaces; she reads information, she contributes actively in discussion boards, she shares photos about presentation slides, she searches for solutions on how to build a product such as a solar energy item at home. And other people do this, too.

## PROBLEMS

Technology has not only the advantage of supporting learning and sharing information; the use of technology can shift learning to a direction where humans and learners are more and more disconnected from the social environment.

There are side effects. In a ubiquitous, digital-networked world, information, all information, seems always to be with us, in our pockets and handbags. Does this make everything perfect? No. Easy access to information does not necessarily make learning easier; access to content does not necessarily mean that a person learns. No learning progress takes place without reflection—and a smartphone, a media tablet or a laptop itself cannot make the user reflect (Jahnke et al., 2012).

Another problem emerges. The digital networked world consists of humans but also social bots, automated software programs. It is not a social media world we inhabit; humans and bots have together created an asocial media world.

Social bots, for example, copy and paste the existing content in huge amounts within a short time. In the name of its programmer, the bots influence the opinion of the human participants, for example, in politics. It is known from psychology research that the more often we hear and read the same sentences, the more readily we believe in them, even though the message might contain false information. Bots did influence, for example, the political opinions and actions of those using Twitter in the Iran election in 2009 and using online communities in the Ukraine crisis in 2014 (read further in “Twitter Bot Influences Real Americans,” NBR, 2011). “The Bot Traffic Report” from 2013 showed that 61% of all networked communication had been initiated by bots. According to Alexis C. Madrigal, senior editor of the *Atlantic*, he flooded Twitter with thousands of automatically generated ‘auto tweets’ and caused 100,000 visits to a single web page, in such a way that no one noticed that they were generated from the same Internet address. The networks of bots and other forms of intelligent computer machinery are part of our Internet-driven world—often with malicious purposes, such as collecting human online profiles and human patterns of activity (Boshmaf et al., 2011; Chu et al., 2010; Wagner et al., 2012).

In addition to such invisible technical mechanisms, there are also hidden social mechanisms. When humans communicate and interact, they create new expectations, and expectations of expectations, and so forth, which create boundaries, intended or not intended, implicitly or explicitly. In the Internet world, such boundaries are, for example, online role structures (Jahnke, 2010b). To take one instance, in online courses, teachers and students have many different roles to perform. Teachers are structure givers, creators of scaffolds, experts, process mentors, designers and colearners in the workplace. Students are learners, consumers, knowledge constructors, creators, feedback givers and sometimes teachers for their peers. This role complexity is like a burden; it is difficult to juggle with the complexity of role expectations—sometimes these are contradictory and cause behavior conflicts. For example, sometimes teachers know that they are in different roles, such as that of a designer, but they do not know how to handle all the different expectations. Sometimes, students do not know that teachers expect them to act as creators; they think the consumer role is the norm. Some students expect that the teacher has the right answer and that s/he tells the student what to learn. In such cases, students will not use web-enabled technology—except where the teacher has designed for its use. This means that the teacher creates a design for learning that fosters social actions by students in such CrossActionSpaces.

These social and technical mechanisms make our environment appear to be an open world. It is not open; we only think it is open. We wish it so. Terms such as ‘open world’ have often been used in recent years, but what does ‘open’ mean? Do all people have access to all information? Is all information open? Are all people open-minded? Is everyone able to learn what and as they wish? CrossActionSpaces are communication spaces in which humans perceive a new quality, a tension between openness and role constraints.

## 4 Introduction

The theories of social roles and social system theories form the basis for this thinking; they remind us that our world is made of social system boundaries in which learning is constrained by the role performance. It is not only the technical system that codes and recodes boundaries; it is human communication that enables but also restricts our way of communication and learning. Learning in this book is understood as a form of reflective communication.

Developing the approach of CrossActionSpaces further, it leads into a new model of how we think about learning, which helps to turn the given learning restrictions into learning opportunities. It also informs new types of learning technologies. In a networked world full of big data, learning is emerging from traditional role performances into multiple-role connections that can be seen in various interactions across established boundaries of systems. A person using her web-enabled devices is at several spaces, sometimes at the same time, physically and online. Cross-actions in relations are emerging. CrossActionSpaces are evolving.

This brings new questions to the agenda: how do humans learn in a digital, interactive, social and antisocial or asocial networked world, especially in such co-expanded spaces? What is the purpose of teaching and how to design for learning? What is the relationship between them?

The book discusses new forms of innovative pedagogy. More specifically, it initiates reflections about relationships of learning, teaching, pedagogy and ICT/tablets in education. What is the new normality? Challenges and unexpected factors will be illustrated. I argue that one answer can be called Digital Didactical Designs for Learning Expeditions (Jahnke, Norqvist & Olsson, 2014), which supports Inclusive Learning Spaces and education for all that does not only rely on access for all but on reflective learning for all.

### 1.1 Classrooms of the Future—Learning in CrossActionSpaces

In this book, I argue that the digital networked world is neither one space nor several social or sociotechnical systems; rather, it can be also understood as CrossActionSpaces. These spaces are emerging through interactions of humans using web-enabled technology. Human behavior in such spaces does not only rely on interactions but also on multiple actions across established boundaries of traditional organizations and institutions. Spaces are constituted through the cross-actions by humans.

For example, a group of people is chatting; during the discussion, open questions arise such as ‘how far away is city X’ or ‘why do so many bees die in the winter’. They use their online networks to find solutions. Another group is learning about automobile mechanics and uses the Internet to find solutions on how to fix an automobile. People are searching for information online, they are using their online networks, they make Do-It-Yourself products offline, and they are part of the maker-movement culture, on- and offline. While acting

in such flexible ways, the off- and online worlds are merging into new spaces. Cross-actions by humans are the creators of these new spaces.

When human action is changing toward such cross-actions, and when learning takes place under the conditions of spaces, then the question is: how to design for learning? What is learning in such a world?

The traditional classroom has been organized around textbooks and a physical location in which to learn. Schools and universities practice teaching and learning as if there existed one right answer. However, the world in the digital age does not work in that way. First, there are always many different answers available to a specific problem. Second, when schools and universities do design learning in such a way where one right answer is available, then learners just can go into CrossActionSpaces and google for the right answers and ask their online networks. Who would not ask the Internet, when we would know the right answer is available there? When we have the Internet in our pockets and handbags everywhere at any time, why shouldn't we use it? This means that schools and universities need new designs for teaching and learning. Instead of creating learning designs where a right answer is available, more complex problems are required where students solve problems together and become makers connecting to real-world experiences. Bring the world, and the world's problems, into the schools and universities by using CrossActionSpaces.

The future classroom will be organized around 'access to' content and, moreover, access to social capital (Huysman & Wulf, 2004). Social capital is the knowledge that people have and communicate: what is not in the textbooks, nor explicitly available otherwise. Social capital can be on the Internet. It is 'in' the social networks; it is also in massive open online courses (Daniel, 2012); it is in Twitter and in all other forms of communication spaces, which create access to these kinds of knowledge.

Figure 1.1 illustrates how the traditional offline classroom and online clouds are merging into new CrossActionSpaces by the expansion of communication beyond the physical walls.

The future classroom will be organized especially around interaction and cross-actions. Teachers will create designs for learning that enable cross-actions conducted by students in groups, sometimes at the same location and sometimes in different places and spaces, to solve a problem in collaboration. The key design factor will be the 'process.' The logic of the future course design will be the process at center and not the location. Teachers design for processes first, and the locations are second. A course in schools and universities is then characterized by processes that enable student activities and cross-actions over time.

CrossActionSpaces can be described as multi-existing co-expanded communication spaces in co-located settings of online spaces and offline places that are made by cross-actions and human communication. I describe this step by step in the next sections.

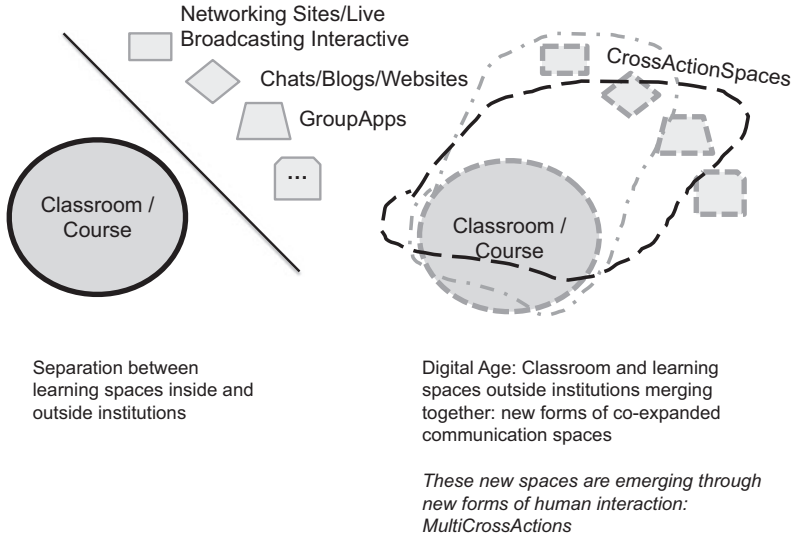


FIGURE 1.1 Moving toward CrossActionSpaces

### 1.1.1 Spaces

Over the years, the classroom has been constructed as a social system (Chapter 2) in which teacher and learners meet. Designs for learning often followed an Instruction–Response–Evaluation structure (Mehan, 1979) in which students reacted to questions by teachers. In the digital age, the old classroom, however, is changing toward a more open space, especially when the teachers and students use digital media and web-enabled technology. In our tablet-classroom studies, we saw such new spaces (discussed in Chapter 6). Students use the media tablet to search for information on the other side of the classroom walls; they are makers of new products, they upload their products into a school Vimeo channel, and they even invite an audience from outside schools to join them in their learning processes. The classroom wall and the construct of the traditional social system are blurring; new spaces evolve. We can call this the system or space perspective.

### 1.1.2 Communication Spaces

The space metaphor does not rely on location but on communication. The space is not constituted by places but by communicative actions of people, learners and teachers. Learning is no longer restricted to the classroom location as a physical place; it is rather the emergence of new spaces for communication where offline places and online communication spaces are merging. The traditional concept of a classroom as a social system is evolving into such communication spaces. These

new spaces are not limited to ‘just more’ offline places or offline locations; rather, these spaces offer new forms for and new ways of communication for learners during their learning processes.

### ***1.1.3 Co-expanded Communication Spaces***

Learners use web-enabled technology to contact the world outside the classroom, for example, to connect to their world and their experiences. In doing so, the learners collaboratively co-expand the traditional classroom boundaries. Suddenly, the classroom is no longer the only place for learning. Co-expanding means that the offline room for communication by learners and teachers is enlarging into the world of all information, the “InfoSphere” (Florida, 2014), and into the world of other learners and their expertise, knowledge, experience and their networks. An example is a platform for teenagers who are broadcasting their activities in real time, live, and they see on their screen via chat function the written questions and comments by other users, to which they react with oral communication. They can even sing in their rooms and invite some friends. However, they expand their space for communication with others when they use such a technical platform. For example, instead of sitting at the marketplace and playing guitar, teenagers sing or play piano at home and have hundreds of visitors, chatting with them and getting feedback; others discuss issues such as not fitting into the societal standard look, and others show short dancing performances. In our tablet-classroom observations, we also saw how teachers and students (8th and 9th graders) used media tablets to extend the traditional classroom communication toward CrossActionSpaces. They created new experiments in the fields of physics and chemistry; they planned, conducted, and video-recorded them; and they used the video to reflect about the failed experiments (if these failed). They then uploaded the videos into a school video channel and engaged in a chat with university students about the experiments and results.

### ***1.1.4 Multi-Existing Co-expanded Communication Spaces***

Terms such as InfoSphere emphasize that offline and online settings are interwoven and intertwined with each other. There is no longer a clear difference between whether we are online or offline. However, there is not ‘one’ big InfoSphere or space—rather there exist multiple communication spaces besides multiple other existing social systems, networks and communities. Therefore, the term ‘multi-existing’ emphasizes that we do not have just one space for communication; rather, we have many multiple spaces that are co-expanding. Whenever we are in meetings and use our tablet to search for information, to check what the lecturer tells us or what a retailer wants to sell us, we create such a new space; when we are sitting in a classroom or lecture hall and chatting about the lecture content with