

Presentation at the Big Data Industry Expo 2017 Guiyang China

First of all I would like to thank the organizing committee for the kind organization and for the invitation. Secondly I want to say thanks to all my previous speakers for a very interesting inside into a quite variety of projects and ideas.

My presentation has a little different scope. It is not so much about technical challenges but more about the a complicated treatment of the technical development and how to grab it. Prof Graebe, who can't be here today, and me choose a quite simple question for such a small amount of time. We want to manage to produce a view not only on our work at the University of Leipzig but also on a quite difficult problem, which challenge our research and teaching for many years. So the title, as you can see, is : Can creative problem-solving be taught?

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In the last years we experienced a technical development which changes the requirements for our students and so for us as researchers and teachers.

Mostly through contacts with the economy we see that the Big Data Analyst, the Data Miner, the IT Project Creator and the Digital Entrepreneur have a change in their working fields and with this a change in the requirements, which also changes in a similar way the requirements for the Humanities.

Besides the demands for a flexible and mobile worker and working environment, we hear more and more the demand for a skill, which enables our students to develop a thinking which goes over the edges. A thinking which can be adapted to different problems and can find new creative and never been seen solutions.

We hear the more and more the demand for an analytic view, for rational argumentation.

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Creative problem solving becomes more and more a skill which is a crucial requirement for the digital age and for companies active in a global stage and state. Leipzig is besides Berlin the mayor city for such developments (??) and has traditional close links to the University.

Through this connections we here from big businesses, as Volkswagen, Amazon, dhl or Porsche the same complaints about missing skills as we hear this from small sector businesses, start-ups and especially from the creative economy.

But now the problem of teaching a skill becomes itself problematic because it is seldom clear what creativity should be or can be. The concept of creativity is in itself ambiguous.

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And more over the whole concept of digital change is ambiguous. To teach a skill which can't be fixed, which can't be shown, which can't be connected to a development, which is also unclear is more than a problem of research and teaching. It is a hard theoretical and practical challenge for the academic performance.

In 2011 the Institute of Computer science and the Institute of Philosophy held talks about the ambiguity of such concepts and especially about the concept of digital change. In one of this

meetings ontologies were in the focus. Prof Graebe and I got in a harsh theoretical debate. To make it clear, for me as Philosopher an ontology is a total different thing than for a computer scientist. I think I don't have to explain here what a computer ontology is. But I want to say what an ontology is for a philosopher. It is nothing less than an explication of everything or even worse of God himself. I know this sounds odd but nevertheless this is, as you can see, a total different meaning. We experienced this problem of the ambiguity of concepts not only on this topic.

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The digital change as concept and as on going development brought even more problems and the need to find a common level.

Especially when it comes to the impact on society. What are the impacts? How can we grab them? Do we have or can find a common way of grabbing them? How can we grab a problem-solving strategy?

What we needed was not only an interdisciplinary approach but an infradisciplinary one. We needed to build concepts while we used them. The concepts became the main problem and the main target for the interdisciplinary approach.

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But this was a challenge for us as teacher and researcher in a theoretical view.

If we want not only to talk theoretical about the concept-development but also doing it academical practical we had to face a complication.

The views of our students, the students which are supposed to learn not only ambiguous concepts but also skills to manage such ambiguity on a problem-solving level, becoming our biggest task.

To make it clear, as we were entangled so were our students. But our students in a quite more basic level. It took us actually a few years to see this straight. The main problem of the students were the usage, more implicit than explicit, of a certain view of what humans are.

They used a certain view of man itself. Mostly a picture, which played with an absolute problematic duality. On the one side the natural human and on the other side the technology as an artefact or tool. The natural human was then mostly combined to metaphors, which worked with some kind of room structure. It suggested there was an in-operational, never explainable centre. You can say they used a centred I.

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To make it straight, the centred I is a complicated presupposition which entangles every talk and every interdisciplinary approach and became the biggest challenge for our project in the first years. Our students from the computer science and from the humanities mostly never thought about the daily usage of such concepts. They just use them and don't see the danger of such metaphoric views. The Centred I metaphor was mostly combined to questions about creativity and there for what creative problem solving can be.

On the one side we saw a combination to a free non-verbal non-logical creativity, the genius, which got then combined to questions about private property and in the end to questions about intellectual property.

On the other side we saw a combination to a dependent and logical creativity, which got then combined to questions of common property and in the end to questions about open and free knowledge.

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So you can see this was a problem not only for the daily talk or for theoretical discussions on what to do in the digital change.

It was a way of expressing harsh deeds and needs that our students from the computer science and from the humanities alike experienced everyday.

Topics ranged about changing laws and especially about privacy and data security. About society and impacts of the digital change especially the boundaries of technology. And sure about policies in general, as the market trade of Big Data Informations for example, industry 4.0 or the global development in general.

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Again it became clear the challenge for use as researchers and teachers, as philosophers and computer scientist is the concept and impacts of the digital change itself, or the digital revolution?

You see quite a difference.

So it is more than important to find a way of talking about it. We needed rational argumentation which can handle an interdisciplinary as an infradisciplinary approach.

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We needed to develop an analytic view as skill for the research but also for a parallel teaching and as a skill for our students which enables them to pass the requirements for creative problem solving in their later professional life.

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So there for teaching and research had to be in close connection for a quite long development.

From 2011 to 2014 we were mostly fixed to the creation of the whole project, which also meant to do it practical.

From 2014 to 2015 we were supported by the University. We transferred the first steps to an excellency project and were able to adapt it to the curriculum of the computer science, the new Digital Humanities and to special offerings for the Humanities.

From 2015 up to now, the project became a full part of the curriculum.

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The structure now contains a lecture, a working seminar, practical work and an interdisciplinary symposium which is held every half year and brings our students together with scientists from other Universities.

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In the project we bring students from the Humanities together with students from the computer science but also from the digital Humanities.

Normally the course includes 2 semesters (??) and is on the current state open up to 40 students.

The staff contains from the beginning Prof. Graebe and myself and every semester we have a range of 2 to 5 tutors.

For the computer science and the digital Humanities it is now a compulsory skill.

For the Humanities it is a key skill, which can be chosen for one or two semesters.

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The lecture had a long development and quite some help from colleagues from all disciplines. Remember it was not really a scientific problem.

The Problem was finding the main issues and how to talk about it. Moreover the view of the students had to be challenged and to be transferred to a level where they also were able to talk about it.

So the first time the lecture was mainly a research lecture, where we tried to present certain concepts and then tried to adapt it with the critics and the theoretical backgrounds of our students.

It was mainly the sharpening of concepts and the talking level. To be totally clear, it is a difference to say ``it is that way`` or to say ``in this view, in this theory it goes like this and that``. There for we had to adapt our talking level as the student had to.

Rational argumentation was and is the ground and basic level of our work.

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The lecture topics now reflect in their structure this challenging development.

The first part is there for about creativity as concept and especially about the ambiguity.

The second part is to show the students their own view and their used presupposition. Here we make the first step and talk about their views in a theoretical matter and combine it to the view of man which they used. We show here the relation to concepts of privacy as to business concepts.

The third part shows the combination to the concept of digital privacy, what it is, how it is connected to the real and administrative privacy concept. Especially the problem of modern data structure and language has to be focused. In most cases the metaphor of the centred I and the concept of a free creativity prevent an understanding of the modern data structure. Most students see this still as a problem of a binary algorithm, which is then just a logical-formal problem. The self reliance of web based data, Meta-data and Big Data can't hardly be understood.

That's why we go in the fourth step to the technical structure of the world wide web and especially to Web 2.0. Here we have to take out a lot of fictions.

The first is the net as a universal end-to-end connection, which has to be replaced by idea of a scale-free-net.

The second is the thought of a computer-to-computer-talk, which has to be replaced by package-and protocol structures on different levels.

The third is the idea of raw pure data, which has to be replaced by showing the textual preconditions of every, even simple informations.

The fourth is the Internet of things as a representation of real world things, which has to be replaced by the illustration of resource identifiers as textual representations. Things in the world wide web are not scanned real worlds objects, they are themselves digital Identities on a textual level. Here we have to talk about quantity semantics and pattern research.

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The fifth step is then concerned about artificial intelligence and modern translation programs. Despite the cybernetic dreams of the sixties and seventies, modern A.I. is not the imitation of the human mind through a fixed set of algorithms but the interpretation of imitation patterns. SIRI and ALEXA are not programmed to pass the Church-Turing test, they find patterns out of BIG-DATA and METADATA sets to have a performance-morph Reaction. To days A.I. as modern translation programs are not driven by Data in the classical way. They change not only our world but also the

most used theories of Humanities, which is especially dramatic in linguistics, psycholinguistic, natural language processing.

The sixth step is there for about the social impacts and especially the changes through Industry 4.0. This will be combined to questions about global policy in the last step.

Let me make this clear again. The first step of the development of the digital change was based on the impossible self description of every System as it was described by Russell and Gödel. Turing's machine was just the idea that a system can produce self-reliant statements over a long time on the basis of a binary code which meant just the reaction of a transistor-function. A function-able Translation-program as an artificial intelligence were more a dream of an imitation that can play the performance of a Human mind. The second phase in which Bits and Bytes alter the time of producing self-reliant statements couldn't change a lot about the utopic targeted performance of the machine. The third phase about the eighties and beginning nineties brought not only the Personal Computer, Visualization but also a unified character set as ASCII or Unicode. Bytes were now not binary in the classical way, they were textual. The fourth phase were now facing with a data structure on a web based infrastructure changes the classical cybernetic dream. It is still impossible to fix a set of imitations but this is not necessary. Modern translation-programs and artificial Intelligence have pattern recognition on textual representations.

ALEXA and SIRI are probably the biggest challenge for the Humanities and for a scientific research about the digital change. They are not imitating the mind, they interpret a complex imitation on a textual level of human behaviour, which sets the net in motion.

It is a challenge to nearly all theories in the Field of Humanities. And again a special challenge for us researchers and teachers, who try to teach our students not only theories but methods to handle difficult problems by them self.

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The seminar tries to do this in a practical way.

This is the place were the students work theoretical by them self.

The thematic range is open and the topic is the choice of the students. And I can tell you we have a wide range, from augmented reality to methods of digital Humanities over gaming industry up to digital methods in modern medicine. Nearly everything without limitations.

Important is that we can mainly focus on the discipline of the students and their theoretical background.

Important is that they do not present their own view but have a stand where they can talk about the theoretical interpretation of the chosen phenomenon or development.

So half of the time is reserved to the teaching of the students.

The other half of the time is reserved for the interdisciplinary discussion.

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Students learn here:

- academic working skills
- presentation techniques
- rational argumentation
- and discursive problem-solving

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Seminar results can, if they fulfill the academic requirements, be published. This has proven to be an excellent motivation.

Furthermore we include the best presentation to an interdisciplinary symposium which is held every semester and brings scientists from other Universities together.

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The final practical work brings the students to projects which use the newest digital methods. A lot of co-operations were possible to create over the last years and I am sorry that I can not present all of them.

We are here not limited to projects from the computer science nor the digital Humanities. A lot of projects are linked to administrative bodies, as the city of Leipzig, to NGOs or to civil society initiatives.

Important is the usage of software management methods as SCRUM for example.

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I will show you now shortly three examples.

The first is the virtual Museum. It is a cooperation with the Institute of art education and local public schools. Students get in close contact with pupils to create a real and virtual exhibition which can be used and expanded on a digital base. Here social networking, design and creation of Meta-data can be learned by our students and in the same time they learn how to break this problems down so children can understand it and handle it.

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The second example is the civil-society-initiative EinundLeipzig. This is a co-operation of journalists, scholars and local political bodies to improve the information situation of the on going change of Leipzig in economical, social and residential matters. We provided long range Big Data Analyses of the gentrification process. This side is now running and an influence for the political debates.

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The third example is the old Egyptian online dictionary, the thesaurus linguae aegyptiae. This is a co-operation of many many partners. The aim was to annotate all old Egyptian dictionaries, especially focused on hieroglyphics, combine them to modern languages and to create an all over machine and user friendly environment. This is working and as I heard from colleagues of the Egyptology that it is a mile stone.

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After all the structures and problems I can raise the question of my presentation again.

Can creative problem-solving be taught?

We can only say yes.

Not as bringing wisdom to the students but showing them a way to it.

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The digital change are going on.

There for we need an interdisciplinary approach which shows other theoretical perspectives.
But we also need an infradisciplinary approach which clears the ambiguity of concepts which we use for techniques and social impacts in our daily talking.

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So what we as researchers and teachers need and what students need to full fill modern requirements

- is a way of talking about things, problems, theories and concepts
- we need rational argumentation
- we need an analytic view
- this is what we consider as creative problem-solving

Thank you for your attention.