



Project Report **openTUM**

Team

Lorenz Baumgartner
Anja Gain
Sarah Klitzke
Tim Kratky
Yuki Nojiri
Max Schütz
Daniel Schwinger
Simone Stegbauer

Tutor

Philipp Geyer
Josef Kimberger
Robin Weiss

Mentor

Prof. Dr. rer. nat. (em.) Bertold Hock
Prof. Dr. Sabine Maasen



Getting connected by openTUM

There was a young man called small Heinz
His alma mater was TUM, not in the vicinity of Mainz.
He came south from there five years ago
and was welcomed with a big “Hello”.

One day he was struck by an issue,
which was so hard that he cried into a tissue.

Someone told him to his face,
You should visit openTUM’s new project database.
He could solve his problem with a trick
by contacting the database with only one click.

This way he got to know some new colleagues,
-Not all of them were freaks-
He said, “They are quite nice.
I want to meet them twice.”

As often in the examination period, the days became long and the nights short. One night, it was already past 2 a.m. when Heinz dragged himself to his bed, unsure if he would pass the exam or even his studies. “What will be in twenty years? What will I become?” With these thoughts he fell asleep...

Twenty years later, Heinz made a career and became a professor. He recognized with surprise that a main focus of his work was influenced by interdisciplinary discussions and teamwork with people from another field. Some older colleagues were really amazed by Heinz’s rhetorical and social skills.

Heinz found that these skills are not naturally given at all, but can be practiced and learned like scientific methods. He was really happy about having taken part in some interdisciplinary projects during his studies. He remembered the openTUM team and their interdisciplinary workshop as well as their database, which collected offers

of different faculties for students. He was also able to share these experiences with his students, who thus got motivated to contact students from other fields. They agreed that a focus on only one subject might provide a solid foundation, but people who want to be successful and fulfilled in life do need a broader horizon. Therefore, Heinz concluded that interdisciplinarity would never be a completed topic, as long as science exists.

A streetcar drove by Heinz’s house waking him. But it took him only a minute to visit the world of dreams again...

Twenty years later, Heinz obtained a responsible position as a manager in a company because of his rhetorical skills, his smart character and his social commitment. He earned a lot of money and remembered that he would never have been able to get into this position without his interdisciplinary soft skills. “I was so lucky, I practiced these skills during my studies”, he said to himself. He found himself in many situations where he had to convince people of the many benefits and advantages of his company. He was able to manage this since he knew the way of thinking of “foreign” people and how to work in an interdisciplinary team.

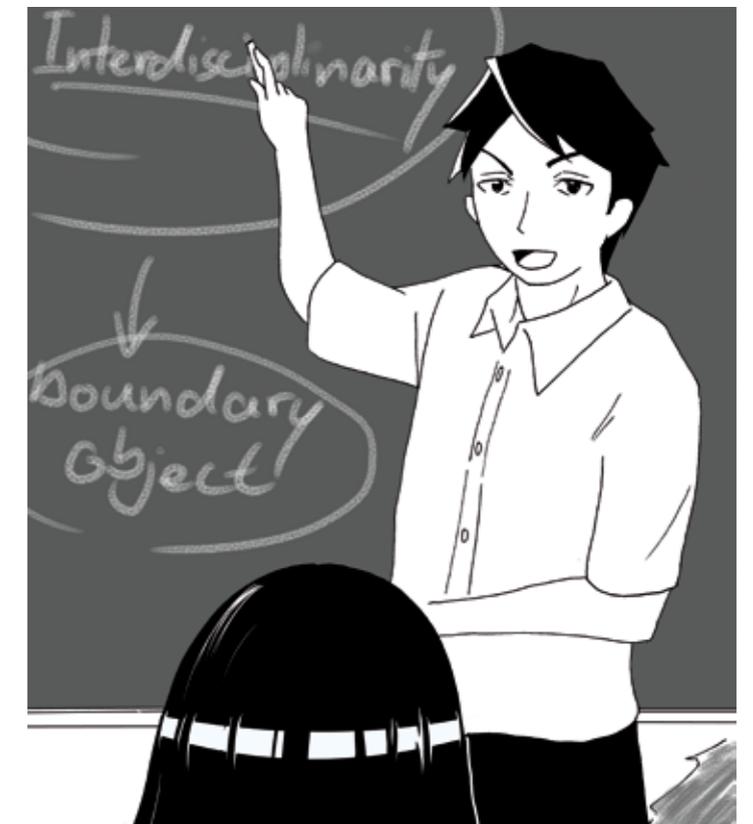
The crying baby of the neighbor woke Heinz, who cursed the thin walls of his apartment. He turned over to the other side of his bed and slowly drifted back to sleep...

Twenty years later, Heinz was going on vacation with his family by car. “Dad, when will we arrive?” “I don’t wanna sit in this car any longer!” “Darling, please do not drive that fast!!!” A “normal” father would suffer a crisis and shout or just stop listening. But Heinz knew about communication strategies and was therefore able to solve the situation in a smart way: He found a reasonable compromise. The holidays were rescued! Heinz remembered that he had learned about the way of dealing with different opinions and characters during his studies by taking advantage of the help



offered by openTUM. “Different people, different cultures...,” he thought with a smile.

Loud buzzing of Heinz’s alarm clock marked the end of the restless night. Stumbling towards the shower, he recapitulated the parts of his dreams he could remember and summarized them for himself: Regardless of whether one wants to make a career in academia or industry or if one becomes a parent, it is important to keep an open mind and to get connected with others.



Abstract

TUM students should have the possibility to gain experience of working in interdisciplinary groups in order to face the increasing interdependence of disciplines in science and industry.

1. Background

Universities can make a contribution to solving the problems of modern society. In many cases, important social challenges and problems cannot be addressed in an uni-disciplinary way, which leads to the demand of an interdisciplinary approach in science. Topics like “climate change” or “cancer” require input from several dominant disciplines (e.g., medicine, geography, chemistry). A satisfying and general discussion about these issues can only be accomplished by teamwork between the different fields (Bergmann, Brohmann et al. 2005):

The term “interdisciplinarity” has to be distinguished from “multidisciplinarity” and “transdisciplinarity” (Bergmann, Brohmann et al. 2005):

- Transdisciplinarity: Participation of people from outside of the scientific context and consideration of their interests.
- Multidisciplinarity: Division of labor between different disciplines working independently from each other.
- Interdisciplinarity: Combining methods of different disciplines to solve a problem which cannot be assigned to a specific field of study.

“Interdisciplinarity requires disciplinary competence. An overlap of empty sets is empty as well. However, also the fascination by the common cause and the capacity for team work contribute to the success.”

Prof. Wolfgang A. Herrmann, President

At TUM, interdisciplinarity is realized in some courses of studies, for example in chemical engineering or energy efficient and sustainable construction, or some courses of the Carl von Linde Academy.

However, no systematic overview of courses and activities exists. Also, there is no general concept of teaching the key competences of interdisciplinarity like communication or project management. In order to promote the teaching of interdisciplinarity to students, it has to be considered that disciplinary knowledge represents the basis of effective interdisciplinary work:

“They [the disciplines] practice specific modes of working on tasks and different approaches to solve problems; in general they have therefore developed typical ways of thinking and acting.” (Rhein 2011)

The home field of study acts therefore as a stable reference and sets an identity in the social context of interdisciplinary working (H. Frehe 2015). The success of an interdisciplinary workshop is determined by how the members work together. Effective interdisciplinarity demands a clear definition of the topic as a so-called boundary object. Also, a structured organization by a responsible team leader is vital for success (Bergmann, Brohmann et al. 2005, H. Frehe 2015). The relationship between disciplines and boundary objects is illustrated in Figure 1.

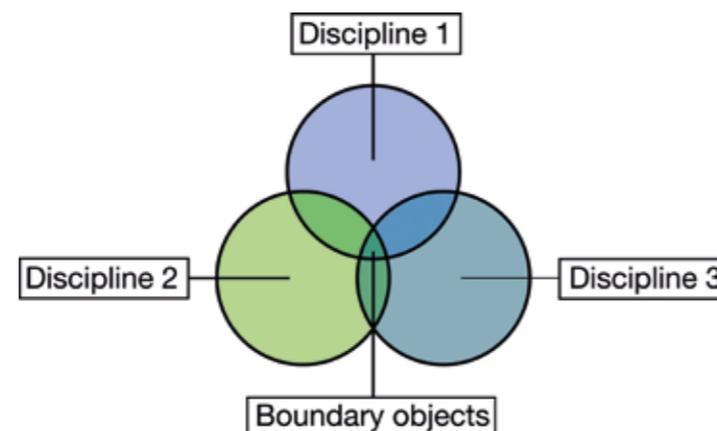


Fig. 1: Representation of three disciplines and their common boundary objects found in the intersections of the different fields.

In the context of teaching at universities, outcome-orientation is essential. This means that the mediated competences should be defined clearly in advance (H. Frehe 2015). During and after the project, the success has to be evaluated, concerning the solution of the given problem as well as whether the used strategies promoted the desired competences (Bergmann, Brohmann et al. 2005, H. Frehe 2015).

2. Goals and Methods

The two main goals of openTUM are to improve the connections among students and scientists at TUM, thus strengthening their network and the exchange of knowledge of different disciplines. We identified two different options to achieve our goals: Either supporting and improving an already existing interdisciplinary program or starting a new project.

“There exist things in the gaps between the domains, which we have not recognized yet, about which we do not know that they exist: potentials.”

Prof. Gerhard Müller, Senior Vice President of Academic and Student Affairs

At the beginning of the project year, we started a comprehensive analysis of the current situation at TUM. We mainly concentrated on existing and well-known interdisciplinary and multidisciplinary projects, trying to get a general overview and to find possible weak spots. We did not only focus on our university but extended our research to other universities like EuroTech universities with the idea of possibly starting a collaboration.

We started our analysis by conducting a survey among 176 students of eleven different departments of TUM. They were asked 15 questions about their experience, needs and wishes concerning inter- and multidisciplinary programs. The students also had the chance to give us their own opinions and to make suggestions about how such opportunities at TUM can be improved.

By conducting interviews with different experts affiliated to TUM, a deeper understanding of interdisciplinarity and its associated problems was obtained. The president of TUM, the director of MCTS (Munich Center for Technology in Society) and six other experts were

asked for their personal experience and advice concerning the teaching of interdisciplinarity. During the interviews, we asked a set of standardized questions in order to compare the answers of the interviewees.

“Interdisciplinarity, in my way of interpretation, are also always highly specialized affairs, specific for a question, as empirical as it, very exactly orchestrated and configured. Not the research of everyone with everyone on everything, but rather with specific people on specific problems.”

Prof. Sabine Maasen, Director of MCTS

After the status quo was evaluated by the interviews, the survey and our own research, we were able to define two final project goals: A central database and an interdisciplinary project module. The database should improve the overview of multidisciplinary programs and initiatives at TUM. Students can either search for a specific program or obtain information about existing events. The concept is realized via Moodle and it is planned to transform it into a website. The ongoing maintenance should be performed by another TUM institution (e.g., AStA).

Five members of openTUM attended the 9th IGSSE forum (International Graduate School of Science and Engineering) in order to observe PhD students from different fields in a series of workshops. We paid special attention to the aspects of scientific work, interdisciplinarity, project management, teamwork and communication.

The interdisciplinary project module, which was devised in cooperation with Prof. Sabine Maasen (MCTS) and Dr. Alfred Slanitz (Carl von Linde Academy), aims to advance the learning of interdisciplinary skills. The aim is to start a first run in summer semester 2016, after the administrative part is organized by the Carl von Linde Academy and the final collaborative partners are determined.

3. Outcome and Discussion

The survey showed that contact with students from other disciplines is important for over 60% of the participants. Personal interest was the most significant motivator for participation in events offered at TUM. All forms of options (sports, culture etc.) enjoy po-

pularity by at least half of the participants. The students have mainly participated in sport courses of the ZHS or language courses offered by Sprachenzentrum. The former shows that the integration into leisure time is important. In addition, the general conditions of the courses (adequate duration, no competing courses, convenient location etc.) are also important. About half of the students have been at university student parties, university fairs or at the “tu film”. However, it was evident that the full range of interdisciplinary courses available was not known.

“Nothing is as efficient and rewarding as the communication with another human being.”

Prof. Michael Klimke, Managing Director of TUM Graduate School

As only 176 students participated and gender and faculty distribution did not correspond with the overall university quota, the survey was not representative but gave a rough overview. In addition, simply convenient sampling was used, also diminishing validity.

Interviews with eight experts provided insights into interdisciplinary work, its characteristics and significance from diverse perspectives. In addition to conventional problems arising from team work, further challenges – e.g., different languages and habits of disciplines – are posed in interdisciplinary projects. However, disciplinary work can also be successful and provides the foundation for interdisciplinary success. As the interviewees were exceptionally consistent in their positive views, their answers may have been biased by the general approval of interdisciplinarity in the scientific community. Interdisciplinary work is not a solution to every problem.

„Interdisciplinarity is endeavor to bring together different disciplines, to exchange ideas and to aim at new goals. As long as there is science, interdisciplinarity will not be exhausted.“

Prof. Bertold Hock, TUM Emeritus of Excellence

For a better overview of interdisciplinary opportunities at TUM, a database was built. Over 30 entries have been collected via collaboration with other parties at TUM. A concept for a suitable website has been drafted. By working together with the Corporate Communication Center, it may be possible to build this website and make it available online.

By attending the 9th IGSSE forum as observing participants, we gained first-hand experience concerning interdisciplinarity and project management. While the benefit of this qualitative approach is the deep understanding one can gain, it is a challenge to treat collected data objectively because of the high personal involvement.

In order to exploit the full potential of an interdisciplinary team, project management workshops as well as a guiding hand are necessary. To create a more focused working atmosphere, the groups should be intentionally matched to assure a boundary object and thus interdisciplinarity. Also a group size of 8 to 10 students is advisable. The working efficiency could be enhanced by providing project management workshops with professional trainers.

The project module is planned for the summer semester of 2016. A timetable of the implementation has been prepared together with the MCTS. The main structure and content has been drafted and partner chairs have already been found.

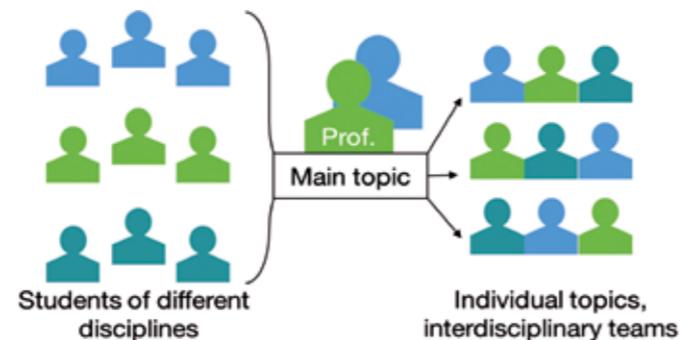


Fig. 2: Structure of the interdisciplinary project module: Students of different disciplines form interdisciplinary teams working on individual topics assigned by cooperation professors from different disciplines.

4. Summary and Future Goals

An interdisciplinary project module for students was designed in cooperation with the MCTS. The basic design is illustrated in Figure 2.

At least two Professors from different fields develop a main topic and assign interdisciplinary problems. These are treated by teams composed of students from different disciplines. Because the members belong to different degree programs, they should be able to contribute their own special knowledge to solve the problem. The project module also features integrated courses about working in interdisciplinary groups and project management.

The interdisciplinary project module is going to be implemented into the teaching program of the Carl von Linde Academy. Its launch is planned for the summer semester of 2016. The course might be chosen as a module in several degree programs of different faculties.

The formation of a relevant network can be catalyzed through the already available but not fully exhausted range of multidisciplinary courses. A central database should improve the overview and visibility of such courses and therefore the network building. Information about 30 different multidisciplinary opportunities at TUM was collected successfully. It will be embedded in an existing TUM related website. The promotion of the database will lead to an increasing knowledge and use of these multidisciplinary opportunities.

„I think that the output of an interdisciplinary team doubles. You write a lot on a paper, but it gets really exciting if you exchange different ideas with other people.“

Dipl.-Ing. Peter Finger, Managing Director of TUM: Junge Akademie

As a result of increasing awareness, the database will be extended with additional or still missing entries. Our goal is the completion of the database to give students and employees an adequate overview over every multidisciplinary group and project. Maintenance and updating will be guaranteed by other TUM facilities.

We hope that our project will help all members of TUM to keep an open mind and will improve their cooperation with people from other disciplines.

“As a human being, you should look after your interests, also the ones outside of one’s subject area. Everyone is self-responsible to shape one’s life in an interesting way; professional and personal life should not be separated because there is only one life.“

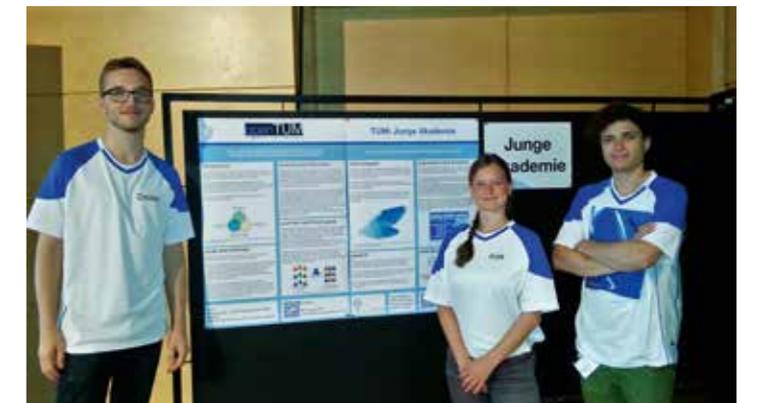
Maestro Felix Mayer, artistic director of the TUM choir and orchestra

Bibliography

Bergmann, M., B. Brohmann, E. Hoffmann, M. C. Loibl, R. Rehaag, E. Schramm and J.-P. Voß (2005). Qualitätskriterien transdisziplinärer Forschung. Frankfurt am Main, Institut für sozial-ökologische Forschung (ISOE) GmbH.

H. Frehe, L. K., G. Terizakis (2015). Interdisziplinäre Vernetzung in der Lehre. Tübingen, Narr Francke Attempto.

Rhein, R. (2011). Fachbezogene und fachübergreifende Hochschuldidaktik und Studiengangsentwicklung. Blickpunkt Hochschuldidaktik. Bielefeld, W. Bertelsmann Verlag.



IGSSE forum



At the top: Teammeeting
Below: Information exchange with MCTS/TUM



TUM Campus Run 2015



Annual Conference of the Academy