



A Report on the values of

Direct-studies Projects and Sailing at TU Braunschweig

GENE 303 International Studies Option Report

Vincent Yin-Chun Ling

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Department of Systems Design Engineering

University of Waterloo

Waterloo, Canada

Table of Contents

1	Introduction.....	1
2	Studienarbeit	1
2.1	An In-depth Research Project	1
2.2	The Waterloo System.....	2
2.3	The Braunschweig System.....	3
2.4	My Work.....	3
3	UNISPORT Segeln	5
3.1	Winter Semester – Theory Lessons	5
3.2	Summer Semester – Practical Sailing Lessons	6
4	Additional Resources	7

1 Introduction

A survival guide already exists for students going on exchange to TU Braunschweig in Germany. For that reason, rather than offering general tips and advice on the exchange, I have decided to write about several topics in slightly more detail that describe certain opportunities and events future students might like to participate in. The two items I would like to focus on are:

1. Studienarbeit / directed-studies project
2. UniSport – Segeln / Sailing

2 Studienarbeit

The first piece of information I would like to share from my year at Braunschweig is this: if interested and possible, arrange to work on a Studienarbeit, or undergraduate thesis project.

2.1 An In-depth Research Project

I believe the process of working in-depth on a project / research topic is extremely beneficial to a student's undergraduate university education. An opportunity to explore, investigate and work hands-on in greater depth and detail on a particular engineering topic allows the student to truly learn how to problem solve and to learn the skills for self-directed learning. In this manner, the student can learn at an early stage in their university career the skills to find academic information, whether it is from journals, experts, and colleagues. The opportunity to dive deep into a subject area also puts many lectures in class into perspective, as a lot of engineering theory is applicable to multiple fields. The experience of

looking into the practical issues in a project also helps the student consider similar issues when new theory / approaches are presented.

2.2 The Waterloo System

At the undergraduate level at the University of Waterloo, typical opportunities to work on an in-depth project are from co-op placements, design project, class projects and URAs.

Often a student is asked to perform tasks while on a co-op term that are not related to their field of study. As we are all familiar, as the junior employees, co-op students are sometimes assigned tasks that no others want to do, but must be done. To fulfill the bottom-line, a company's concern is often productivity, and the educational value of the experience for the co-op is not guaranteed. These issues can prevent a student from focusing on and diving into solving a problem.

Design projects are an excellent way to obtain experience in a particular topic, but often design projects are in groups, and although educational, a lot of effort and time is spent on team work and management. Since design projects are 1 of 5 or 6 classes in a student's schedule, the student must also focus on the course work for all other courses, prevent a student from focusing and thinking about the problem full-time.

URAs are also an excellent opportunity to achieve the same goal, but the problems are with the limited availability of placements as well as time demand from a full course load already taken upon by the student. Unless a student is extremely outstanding and can complete the 5 course workload with ease, it is very difficult to have time and energy left to truly become engaged in a research topic and put sufficient time into it to obtain positive results.

2.3 The Braunschweig System

At TU Braunschweig, all engineering students are required to work full-time on both a Studienarbeit (undergraduate thesis) and a Diplomarbeit (masters thesis). Due to this requirement, structure is already in place to accommodate for a greater number of students to work on full-time research projects. This means more opportunities and interesting projects are available for a student to choose from as compared to the limited URAs or research work-terms with professors here at Waterloo.

During the Studienarbeit, a student often works alongside German students working on either a Studienarbeit or a Diplomarbeit. This opens another exciting opportunity for the student to interact, learn German and start friendships with locals. It is interesting also, because often when a student meets a German student through another facet, the student is one who is out-going or has gone on an exchange, and so wants to be engaged with incoming exchange students. During the Studienarbeit, on the other hand, a student gets a chance to meet more typical, or even quiet, German students. Nevertheless, from my experience, they are all very nice and accepting to foreigners.

The full-time requirement gives the student the chance to really think about and work on a problem with minimal academic pressure. The greater freedom in time and scope cultivates an excellent learning opportunity for the student.

While working on a Studienarbeit, a student gains simultaneous exposure to an academic research environment as well as engineering research in Germany. This gives the student another perspective.

2.4 My Work

As my 5th work term, between April and August of 2005, I worked on a Studienarbeit for the Institute of Electrical Measurements at the TU

Braunschweig. In collaboration with a neurologist and his research group in Berlin, the goal was to develop a mobile ECG system through the use of novel electrode technology. My role was to research and implement digital signal processing techniques for removing external noise in the ECG system. The task at hand was to minimize various disturbances, including interference caused by movement, breathing, as well as power-line and high frequency sources, to accurately extract the electrical heart signal.

Through research and consultation with digital signal processing experts at the university, I compiled a set of suitable filters for removing the disturbances. After implementing the suitable filters, we were able to, for the first time, establish the viability of the system and the new electrode design. I then went on to perform a detailed analysis to evaluate which combination of the filters offered the best filtering characteristics for our specific application and came to a conclusion with very positive results.

Unfiltered, the noise in the electrical signals was at least two orders of magnitude greater than the actual heart signal. The attached electrocardiograms demonstrate the establishment of the viability of the design. The data in the background was recorded with commercial ECG equipment in the lab. The signals extracted and filtered by the prototype system (thicker and noisier traces), though not as clean as those offered by the commercial system, were sufficiently similar to provide the institute with qualitative evidence needed to continue developing the system.

I authored two reports for the work term, one detailing the overall design process and results of my work, the other presenting a comparison and analysis of the various filter designs. The results of my work will be published in a paper the group is currently working on. Professor Meinhard Schilling, my supervisor, has informed me that I will be included as author of the paper.

3 UNISPORT Segeln

There is no doubt that the recreational sport program at Braunschweig is larger, and arguably more affordable, than Waterloo. I would like to encourage exchange students to take the opportunity to join and explore something new and exciting that is not available at home.

Over the year I decided to give sailing in Braunschweig a try. Every time I see Lake Ontario, as a Torontonian, I have an urge to take up sailing in order to enjoy the one of the largest bodies of fresh water in the world. Because of a busy schedule for coop terms in Toronto, as well as high costs, it was difficult for me to learn how to sail. Waterloo does not offer any sailing courses to my knowledge, either through the university or near-by clubs, and the higher workload over the course of a term does not allow for travelling far to take lessons.

In Braunschweig, sailing lessons are offered though UNISPORT, the university's sport center. The program spans the two semesters in a year, with in-class theory lessons in the winter semester, and hands-on practical training in the summer. The total cost is around 400 euro, a good value for what is offered. See link below for more details. I felt that it was worth every euro.

There are typically 80 spots per semester available for sailing. Demand is much higher than supply, as there are a limited number of trainers and sailboats available in the summer semester for practical training. A random draw was conducted to select which 80 individuals got the chance to sail in the summer.

3.1 Winter Semester – Theory Lessons

In the winter semester, weekly lessons are offered in the evenings, covering various topics on sailing, such as navigation theory, knots, setting up and putting away a boat, weather, parts of a sailboat, etc. The theory is quite interesting, and the teacher, Jan Stulle, is a nice fellow.

At the end of the semester there is a written exam to test, which one must pass before being allowed to participate in the on-water practical lessons. There is a required textbook which goes into more detail on all the topics presented in class. The textbook contains good explanations and diagrams / pictures, and more importantly contains all the questions that the German Sailing Authority can test one with on the written exam. Model answers corresponding to the questions are provided. During the exam, due to my immature German language skills, I resorted to a creative mixture of German, English and diagrams to answer the exam questions. The licensing official told me that he had never seen an exam like what I had produced over his many years on the job, and was very impressed at my results.

3.2 Summer Semester – Practical Sailing Lessons

In the summer semester, when the weather warmed up, our group met each Sunday. The 80 or so individuals participating in hand-on training in the summer are divided into groups of approximately 12. Each group has a specific time during the week when they meet to train. My group, being the Sunday morning group, did not have to rush without an afternoon session to follow. For that reason, every Sunday we were able first enjoy a nice, relaxing breakfast, provided by different individuals each week. Then, around 10:30, we would get the sailboats ready, and head out onto the lake for three hour hands-on training lessons. During the 10 sessions, we learned various manoeuvres for handling the boat, rescuing individuals when they fell overboard, to dock and to cast off. We learned what to do when the sailboat capsized. The small sailboats are usually navigated by two people at the same time, and can carry one or two more passengers. At the end of the season, there is a practical exam. The examiner draws on a clipboard the sequence of manoeuvres he or she wishes to see, and the examinee must perform it with his or her partner. The exam is not simply a

formality: some individuals fail every year. I passed the practical exam, and now hold the 1st level German sailing license.

In addition to learning how to sail, I found that this activity helped my German comprehension and speaking abilities tremendously. Towards the beginning, the sailing course offered an additional motivation and opportunity to learn new vocabulary in order to understand both the textbook and what the sailing instructor was saying, vocabulary that was not technical in nature those found in engineering classes. In the summer semester, while learning how to sail with a group of 12 others, it was an excellent opportunity to learn to communicate with others in German. Most individuals in my group are not the Germans who frequently come into contact with international students, and as such they preferred to speak in German. This was another great venue to improve my speaking and comprehension skills.

Initially the instructors and locals were very skeptical at my participation in the program. Even locals typically find course difficult, as the sailing exams are not simple formalities. My perseverance eventually convinced them that I was serious, and ended up earning me respect, friendships and a great experience.

4 Additional Resources

<http://www.unisport.tu-bs.de/>

<http://www.unisport.tu-bs.de/sportarten.php?sportartid=180>

<http://sport.unisport.etc.tu-bs.de/~segeln/>

Costs for the 1st level license

<http://sport.unisport.etc.tu-bs.de/~segeln/index.htm?topic=3&subtopic=0>