

2nd International Conference on Higher Education Advances, HEAd'16, 21-23 June 2016,
València, Spain

Compact Freshmen Welcome Seminar for Engineering Students

Andreas Diehl^a, Lilli Wolff^a, Thomas Fuhrmann^{a*}, Michael Niemetz^a,
Stefanie Mörtlbauer^a, Sandra Dirnberger^a

^aOTH Regensburg, Faculty of Electrical Engineering and Information Technology, Seybothstr. 2, 93053 Germany

Abstract

The Faculty of Electrical Engineering and Information Technology of the OTH Regensburg developed and implemented a compact freshmen seminar for the afternoon of the first day of study. The intention of this seminar is to help the freshmen during their transition between school and study without losing lecture time in the first semester. The concept was tested with one small study group at the beginning of the summer semester 2015. To rate the impact of the seminar and to find aspects for continuous improvement an evaluation method was developed and used. Due to the good student resonance during the first run, this introduction seminar was held again in the winter semester 2015/16. It is planned to integrate this seminar as a regular session for all freshmen of the faculty curriculum and monitor the long-term effects of student motivation and success.

© 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the organizing committee of HEAd'16

Keywords: Engineering Education; Freshmen Seminar

1. Introduction

The German Universities of Applied Sciences face the challenge that the freshmen heterogeneity is increasing. Almost each student has his or her own individual educational path. This ranges from very young adults who are 17 or 18 years old and have just finished their school education to professional practitioners in their mid-thirties who finished school at least fifteen years before. The freshmen within this heterogeneous group have different experiences, different knowledge and different expectations linked with their study courses.

* Corresponding author. Tel.: +49 943 941-1002; Fax: +49 941 943-1419.
E-mail address: thomas.fuhrmann@oth-regensburg.de

The morning of the first day at the OTH Regensburg starts for all freshmen with welcome presentations given by the University President and the Lord Mayor of Regensburg. After these general opening speeches to all new students, the day continues in the faculties with specific information presentations. During these sessions, the dean and members of the students' council present a broad range of essential information ranging from organizational basics to specific hints and typical challenges for newcomers. During this short time, a huge amount of information is delivered to the freshmen. However, experience gives the impression that they are not able to gather and understand all important facts and their study success impact. For example, we see many students who face difficulties with mastering their exam preparation efficiently and effectively, which leads to high failure rates in the first exams. A survey about how to optimize the introductory phase of the existing bachelor programs at the faculty also showed that 62% of the surveyed students believe that the visited introduction event was no valuable guidance for them (Dirnberger, 2014).

To improve this current situation it was decided at the Faculty of Electrical Engineering and Information Technology to offer an additional introduction seminar as of the summer semester 2015. The regular lectures for the freshmen traditionally start on the second day of the semester, leaving unused the afternoon of the first day for academic studies and giving the impression of a school-like environment. Therefore, it was decided to carry out the new introduction seminar during this time. The success of the seminar was evaluated to improve the program for the winter semester 2015/16 with about 350 beginners and to enable a continuous improvement and adaptation to beginners' needs. Due to the positive resonance of the students, this introduction seminar was also carried out during the winter semester using a slightly modified and improved concept.

In this work, we describe the background and the motivation our freshmen welcome concept. First, we give an overview of some other seminar concepts in Section 2. Challenges for freshmen and our seminar goals are depicted in Section 3. In Section 4 we explain the concept applied in the first run in summer 2015 and the modifications made for winter 2015/16. The evaluation approach for the seminar is shown in Section 5. In Section 6, we summarize our results and give an outlook to further planned activities.

2. Freshmen Seminars at Other Universities

The idea of offering freshmen seminars to reduce dropout rates and increase motivation is not new. Many other universities developed study introduction concepts for freshmen to boost their motivation, eliminate knowledge deficits and therefore reduce the dropout rate. Most of the programs are quite time consuming, lasting for several days or are integrated as a weekly lecture in the first semester. Typically, a mixture of lectures and small projects is offered during the first semesters to show connections between theoretical knowledge and practical applications (Madhu, 1993; Standridge et al., 2006; Rothe, 2015; Reith et al., 2015). A similar approach starts with an introduction week, carries out additional trainings and projects during first and second semesters (Mackensen et al., 2015).

While all these concepts on the one hand address the identified deficits, they also reduce on the other hand the lecture time available for technical content during the first semester. Therefore, the benefit of increased learning effectivity provided by the freshmen introduction seminar has to be weighed against the importance of the lecture hours that are lost. Therefore, our intention is to provide a compact seminar with all necessary content to the freshmen without reducing lecture time and changing semester structure by making use of the first study day afternoon. With this approach, we do not lose lecture time, because the first lectures for the beginners are scheduled for the second day of the semester. The detailed concept for this approach is explained in the following sections.

Table 1. Missing Knowledge at the Study Start (OTH Regensburg, 2014).

Field of Deficit	Percentage of Beginners (self-estimation)
Mathematics	31
Physics	41
Information Technology	28
Academic Writing	28
Self-management	33
Learning Techniques	30

3. Challenges for Freshmen Students and Seminar Goals

To get an objective feedback about the freshmen deficits the students of our university have been surveyed in 2014. Table 1 shows the results of this survey. Many freshmen see missing knowledge in all relevant areas reaching from mathematics to learning techniques. In an additional survey, about 40 percent of our freshmen express the wish for additional support to organize their studies and to improve their learning and working techniques (OTH Regensburg, 2014).

Regarding these challenges, our goals for this seminar are:

- Assistance during the transition from school to university. Becoming more familiar with the life in a university and to support them in developing their study career.
- Give hints for the first semester and help them starting their productive learning earlier.
- Analyze the learning type of each student and help him or her to find a learning strategy.
- Enable them to detect mathematical or technical knowledge deficits, which is the basis for autonomously compensating these.
- Get them acquainted to the location of lecture rooms, labs and computer rooms.
- Make them aware of the existing study regulations and deadlines relevant for their chosen study program.
- Motivate them to get through the first semesters, which are covering mainly basic knowledge with non-obvious relevance for their later professional life.
- Initiate the process of forming semester groups and learning groups.

In order to encourage the freshmen to ask questions and to motivate them to contribute actively, the workshop was mainly organized and moderated by members of the students' union supported by a master of social pedagogy and employees of the Faculty of Electrical Engineering and Information Technology. For the math test, also professors were contributing as test supervisors in order to stress the test character of that particular part of the seminar.

4. Freshmen Welcome Seminar Structure

The workshop is divided into four parts framed by a short introduction and a conclusive evaluation. Table 2 shows an overview of the different parts and their duration for the first run of our seminar in the summer semester 2015 and for the second run in the winter semester 2015/16. Due to the large amount of students taking part in the second run, we decided to align all parts to the same duration, thus allowing establishing parallel groups in different stages and switching them.

Table 2. Structure of the Introduction Seminar.

Topic	Summer 2015	Winter 2015/16
Welcome	10 min.	15 min.
Self-reflection, expectations and targets	40 min.	45 min.
Group math test	30 min.	45 min.
Break	15 min.	15 min.
Introduction to computer infrastructure	30 min.	45 min.
Lab experiments in groups	30 min.	45 min.
Short evaluation	15 min.	15 min.

4.1. Self-Reflection

In the self-reflection part, the freshmen are asked to define their own targets, check their expectations for the first semester and write down the most important results within about ten minutes. After completing this, the freshmen present their notes to the group of peers shortly. This allows them to compare their individual goals with each other and the first identification of compatible learning partners can be done. As a result, it became clear that most of the students had similar expectations regarding their studies. During the break and on the way to the rooms for the next part of the seminar the students can get into contact and start to build relations to preferred team-partners to form a learning group for the upcoming semester.

The first run of the seminar showed that the self-reflection part had to be restructured for the second run. One of the reasons was the large number of duplicates in the statements of the students observed in the first run. After some presentations there was no additional valuable information for the rest of the group. Another reason is the much higher number of participants in the winter semester leading to larger groups. Due to this, for the second run the self-reflection has been structured into three parts. First, every one of the group had to fill out a test form on learning behavior to check their individual learning type. After that, the group was divided into three parts for discussing different topics within each subgroup for fifteen minutes. Afterwards, for each group one of the group members had to present the results to the rest of the students. Because of the discussions during the group work, the obtained results were more useful and different between the groups. In addition, a handout on self and time management strategies was provided to the participants. This also included some hints on useful literature for their studies.

4.2. Math Test

The participants have to solve a math test containing engineering fundamentals. This is approximately on high-school graduate level, so the mathematical tasks were equation conversation, differential calculus and solving a system of equations. In summer 2015 the newcomers were asked to sketch the exponential and logarithmic function instead of converting equations. The author of the math test chose this content because all students of the faculty have to master this basic knowledge. Otherwise, the freshmen do not have any chance to pass the first semester. In winter 2015/16 some professors supervised the test in cooperation with some senior students to simulate an exam situation. As in the run of the summer semester 2015 there was a lack of working time for the test, in the winter semester 2015/16 additional 15 minutes were used for the math test. After solving the required tasks, the students should check themselves in small groups of three persons if they have mastered the mathematical requirements for a successful study or if they should repeat some fundamental topics.

4.3. Computer Pool

For the seminar part taking place in the computer rooms, the students are required to find the computer rooms autonomously in order to learn the navigation through the university building. The first task in the computer room is to log into the university computer infrastructure using their personal account the students received upon enrolment

at the university. After this challenge the trainers distribute prepared worksheets for important tasks like finding the module manual, the scheduling table containing the most important dates and deadlines (beginning of registration to examination, the period to enroll for the next semester, etc.), the examination regulations and the timetable containing their courses.

They also learn how to register themselves with the electronic learning system and how to inscribe themselves correctly online into courses. This enables them to quickly find teaching material provided in this system as well as efficiently getting the latest news on their courses. The last task within this part of the seminar is to find some books in the electronic catalogue system of the university library.

4.4. Lab Introduction

The fourth part of the welcome seminar is a short laboratory session. For the summer semester 2015 welcome seminar, the students had the opportunity to test a simple model of a smoke sensor. A senior student and member of the seminar organization team presented the layout and structure of the test board and explained the basic function principle. A wooden box with different chambers, an LED light source and a photo diode are used to build a smoke detector. A smoking stick produced the fume. The main principle of this smoke detector is shown in Figure 1. As soon as the smoke is intruding into the device, the red light produced by the LED is scattered at the smoke particles and is detected by the photo transistor. In addition, an electronic board with an LED driver and an evaluation circuit is prepared for the students, so they only have to supply the board with the correct voltage and display the signal of the light sensor on an oscilloscope.

In the winter 2015/16 run there were too many students to carry out this experiment, which needs extremely intensive support. Therefore, a lab tour was organized for the freshmen students to show them some interesting technical equipment and experiments for example in the high voltage lab or in the lab for electrical machines.

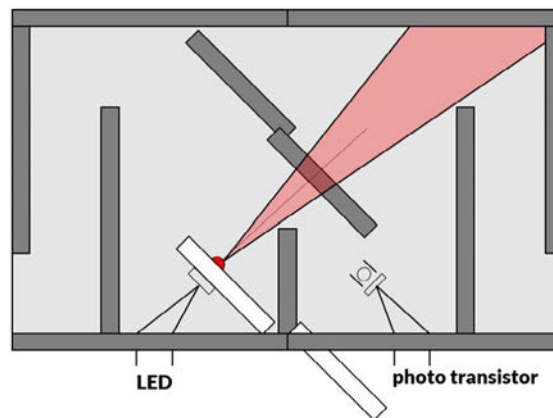


Fig. 1. Schematic Drawing: Smoke Detector (Kohlert, 2015).

5. Evaluation and Results

In parallel to the realization of the compact freshmen welcome seminar a concept for evaluation of the seminar and its impact was developed. The goal is to enable a continuous improvement of the seminar and to adapt the contents to evolving needs of new generations of beginners. Therefore, three different types of evaluation seemed to be useful.

5.1. Immediate Feedback Session

At the end of the introduction seminar, the students were asked directly for feedback. In summer 2015 an informal and voluntary oral feedback session was held immediately after the last part of the seminar where the participants were asked what they liked most, which information seemed important to them, what contents they missed and which changes they would propose to improve the seminar. All in all the students were satisfied with the introductory seminar and found it a useful event to attend. They most enjoyed the experiment in the electronics lab. Furthermore, they stated that the self-reflection takes a lot of time and suggested to do some group work during the self-reflection, fostering acquaintance and saving time. This directly motivated us to apply improvements for the second run.

The participation of the welcome seminar enabled me to contact fellow students.
 The welcome seminar showed me what to expect in the first semester.
 I have learned useful strategies and techniques to organise my first semester.
 The math test pointed out my personal deficits.
 The part in the computer pool was useful.
 The participation in the seminar had a positive impact on my personal motivation.
 I liked the seminar.
 I would recommend other students to attend the welcome seminar.

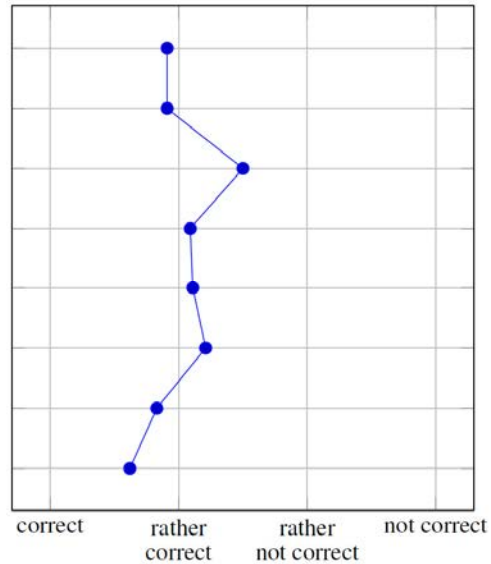


Fig. 2. Results of Immediate Feedback Session in Winter 2015/16.

In winter 2015/16 the immediate feedback was collected orally in a feedback session, where the students expressed the wish to get the information about the welcome seminar earlier to be better prepared in terms of time planning and equipment. In addition, a short questionnaire was used to acquire standardized feedback. Figure 2 shows the results. The students liked the seminar and would recommend their successors to attend it. Also all parts except the self-reflection were seen positive. We plan to investigate the needs of the students in terms of self-organization more in detail in the end of semester evaluation, in order to derive concrete improvement actions.

5.2. Questionnaire Survey

In addition to the qualitative feedback at the end of the seminar there was developed a quantitative evaluation instrument to check the effects of the seminar at the end of the semester. Besides the first semester students also the second semester students who did not have the chance to participate in the welcome seminar were asked to answer the survey. They are serving as a statistically independent control group for the analysis of the obtained feedback besides the first semester students who did not participate in the welcome seminar and are not statistically independent as they freely decided to do so. The first part of the questionnaire includes general questions concerning motivation, learning-strategies and self-management during the first semester. The second part includes specific questions on the freshmen welcome seminar and is consequently only to be answered by participants. It explores if

the participation was helpful to clarify expectations, simplify the beginning of studies or reflecting and developing individual learning-strategies. Furthermore, it asks for the personal benefit experienced during the seminar and for improvement suggestions for future runs.

Table 3. Questionnaire Mail Results.

	correct (1)	rather correct (2)	rather not correct (3)	not correct (4)	average grade
Motivation: The first semester encouraged me to continue with the selected study course.	31	30	12	6	1.91
Expectations: The first semester meets my expectations completely.	14	40	21	6	2.23
Targets: I set firm targets at the beginning of my study.	40	29	9	3	1.69
Target Achievement: I already reached all of my targets for the first semester.	20	18	34	9	2.40
Presence: In the first semester, I attended lectures regularly.	54	21	6	1	1.44
Activity: Normally I actively participated in lectures.	19	37	24	1	2.45
Continuous Learning: I started learning right from the beginning of the semester.	11	20	39	12	2.63
Self-Management: I can manage learning, working and leisure time well.	11	34	26	11	2.45

In the evaluations at the end of the summer semester 2015 we got back 80 filled questionnaires with the major part having been provided by second semester students. Consequently, no statistical relevant conclusions could be obtained from the questionnaires filled by the participants of the seminar. However, the evaluation of the control group data and the first part of the questionnaire delivered interesting results, which are listed in Table 3. The results can be used as impulses to reflect and improve the seminar contents as we can check if they fit the needs of first semester students and if the expected demands of students on such a freshmen welcome seminar is covered. Most of the students answered that the first semester encouraged them to continue with the selected course of study and that they enjoyed their time at the university. Additionally many students stated that they set themselves firm targets for their study. This shows that first semester students are motivated and target orientated. Although the students state that they attend the lectures regularly and participate actively (presence and activity), they did not learn continuously during the semester. Therefore giving decisive impulses for the importance of continuous learning right from the start of study is one of the most important targets of the seminar. Furthermore, deficits in time and self-management can be presumed because the evaluation results show that it was not always easy for the students to organize learning, working, and leisure time well. Due to that, it will be necessary to foster these issues in future freshman seminar runs.

6. Conclusion and Outlook

In order to address the diverging educational paths of life and heterogeneous knowledge of the beginners we developed a new concept for a compact freshmen seminar for the afternoon of their first study day. The first run of the seminar was performed with a small group of beginners and it took place in the summer semester 2015 where just one bachelor group started. By implementing the individual parts in parallel sessions and changing the lab experiment to a lab tour it was possible to offer the seminar for more than 350 beginners in the following semester. We developed a questionnaire and acquired standardized student feedback. Due to the low number of participating students, no statistically significant evaluation of the participating student data was possible after the first run. However, the control group data obtained in this survey was analyzed and will be used for a statistical analysis of the feedback data of the winter 2015/16 run. We are confident to get enough statistical data due to the high number of participants for evaluating the effects of the seminar based on the results.

The resulting information will be used for continuous improvements of the seminar content. The topic ranked weakest in the evaluation, the coverage of self-management capabilities of the students, will receive special attention in future work on the seminar content. We consider the efficient usage of the first study day an important achievement, giving the students the correct impression about the efforts needed for a successful study. Therefore, it is planned to offer the welcome seminar for future beginners on a regular basis. Currently it is discussed within our university to spread the seminar also to other technical faculties, which have similar challenges with high dropout rates.

References

- Dimberger, S. (2014). Studieneingangsphase neu gedacht. Eine Konzeption zur Optimierung der Studieneingangsphase in den Bachelorstudiengängen der Fakultät Elektro- und Informationstechnik an der OTH Regensburg (Master's Thesis, OTH Regensburg).
- Kohlert, D. (2015). Electronics, Lecture Script, unpublished.
- Mackensen, E., Lurz, C. Reichert, A. & Köbler, J. (2015). Enhancing the motivation and success of freshman students in interdisciplinary engineering degree programs. In IEEE EDUCON.
- Madhu, S. (1993). The freshman seminar for electrical engineering students at RIT. In IEEE FIE.
- OTH Regensburg. (2014). Student survey.
- Reith, D., Bachmeier, C. & Groß, I. (2015). Be an engineer right from the start. In IEEE EDUCON.
- Rothe, I. (2015). Work in progress: starter-project for first semester students to survey their engineering studies. In IEEE EDUCON.
- Standridge, C. R., Kundrat, M. E. & Pedreros-Oviedo, C. S. (2006). Creating the context for learning engineering: a seminar for freshmen. In IEEE FIE.