



Training and Education



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The central aims of the Faculty of Medicine in Ulm are the continuous development of its curriculum, the improvement of its learning approach and the evaluation of its study setting. The Student Dean's Office is responsible for the organization of all aspects of medical education, for example, management of the curriculum, counseling for students and teachers, and innovations in teaching. This routine and service section as well as project realization is integrated into a competent statewide network specializing in medical education. In this report, we would like to give some examples of the teaching projects realized in cooperation with the faculty's commission on medical education that have brought together academic faculties, student representatives and the university's administration.

The Medical Faculty of Ulm University offers courses of studies in Medicine, Dentistry and Molecular Medicine (Bachelor, Master, PhD). In the following pages we will summarize the main features of these courses of studies and those aspects specific to Ulm University.

Medicine

Competence Center of E-Learning in Medicine

Within the competence network of medical education in Baden-Württemberg, the Competence Center of E-Learning at the Faculty of Medicine plays a significant role. The Competence Center of E-Learning has taken on the task of developing long-term strategies for the introduction of new web-based technologies in academic medicine and to realize quality assessment systems, for example, within our complaints and idea management system.

Theatrum anatomicum

To provide a new teaching facility, the *Theatrum anatomicum* was established in 2008. In the centre of this room there is a mobile operating table which students can view from a nearby observation platform during demonstrations. The state-of-the-art technical equipment includes such features as full HD video transmission, flat screens, a sound system and power-mac while an attached scrub room allows 6-8 persons to perform a surgical scrub. Students at Ulm University are instructed in anatomy during the first three consecutive semesters. First semester medical students are introduced to the subject of general anatomy with demonstrations of the skeletal system, the application of major anatomical principles, and initial hands-on experience with human corpses. Second semester students, having gained a more complex insight into the human body, are given anatomical presentations emphasizing a deeper understanding of organ systems and their topography. Third semester students, who have attended the entire anatomy course, benefit further from clinical scenarios. Small group training includes clinical skills, such as suturing, scrubbing, insertion of central venous catheters, tracheal tubes and basic hygiene rules. Clinicians perform example operations and

invasive procedures as part of the main anatomy course to underline the relevance of anatomy within the context of basic scientific knowledge. Students assist directly at the operating table under realistic operation conditions. The *Theatrum anatomicum* provides the opportunity to allow students to be trained in basic surgical skills and authentic professional behavior, and thus combines clinical and preclinical education with anatomical surgical procedures and techniques.

Surgery Training Concept

As for teaching in surgery, we have concentrated on developing three main areas: practical training (including lab skills); bedside teaching; and the assessment of clinical skills. In addition, for the benefit of all five departments of our surgical center, there is now a full-time interdisciplinary clinical teacher whose main function focuses on practical and clinical teaching, teaching in the surgical skills labs and bedside teaching. This newly created position is directly under the control of the director of the surgical center. For the practical parts of the surgical undergraduate course, all the pre-existing timetables concerning a student's workload in the operating rooms, on the wards in the outpatient departments, in the lecture halls and in the seminar rooms, have been coordinated in such a way to avoid friction and promote positive interaction between the different departments. Teaching in radiology has been effectively integrated into the practical courses in addition to the teaching of ethics. A curriculum that is oriented on a surgeon's everyday work has also been developed. Planned, but not yet realized, is the direct transmission of typical operations to the seminar rooms whereby operations would be explained step by step while demonstrating the most important, or the most critical, steps of the operation and allowing students to ask questions concerning surgical procedures. Bedside teaching includes "teaching ward rounds" and the demonstration of surgical skills and techniques. This part of surgical formation is one of the most important tasks of the interdisciplinary surgical teacher, who,

in order to prepare fifth year students optimally for their exams, offers "simulated mini-examinations" and gives feedback based on individual assessment. Besides this, the use of OSCEs (Objective Structured Clinical Examinations) for the assessment of practical skills has been further developed: The number of practical tasks has been increased while the number of paper cases has decreased - a highly efficient step that further enhances the effectiveness of this unique examination format.

Clinical Rotations with Bedside-teaching and Lab Skills Training

The project *Bedside Teaching* was inaugurated in October 2009 in the Clinic for Internal Medicine at University Medical Center Ulm. This project has as its goal the comprehensive improvement of the practical training of medical students in both their clinical rotation in Internal Medicine and during their internship year.

The learning objectives are to obtain a complete medical history, perform a complete physical examination, recognize pathological clinical findings, record correct documentation, perform phlebotomies and place indwelling venous catheters. Other goals include independent evaluation of ECGs, performing a bedside test under supervision, and practicing skills



needed for patient education and informed consent. For students in their internship year, the project provides two additional seminars conducted exclusively at the bedside to supplement the previously offered seminars. The following didactic components were implemented in small groups: an introductory course (*Skills Lab*); teaching rounds (*Findings Exchange*); structured practice at ECG evaluation; a bedside test; and patient education/informed consent. Student progress was documented using a log with regular monitoring of entries. One objective that remains to be implemented is to assess student skills using an objective structured clinical examination (OSCE). The specific benefits of the above-described didactic components relate to the systematic approach of teaching basic medical skills at the bedside. Moreover, the continuous supervision of students by a single instructor offers significant advantages. Students in their internship year are offered additional weekly teaching rounds as part of the project. Innovative aspects of these didactic sessions are their high relevance to clinical practice, their interdisciplinary approach within the framework of medical subspecialties and continuous supervision by an instructor.

To date, the reaction from students has been extremely positive “We think it’s great that there’s someone who has the time to explain things, and can help us with our problems and concerns.” („*Wir finden es gut, dass es jetzt jemanden gibt, der Zeit hat uns die Dinge zu erklären, und an den wir uns wenden können, wenn wir Probleme oder Bedenken haben.*”)



Simulated and Standardized Patients in Medical Education

Since 2008, Ulm University has employed simulated patients (SP) in medical training. By employing SPs, the communicative and social skills of students can be optimized and this makes it possible to teach students useful ways to deal with patients even in difficult and stressful situations. The SPs are trained to act the role of patients suffering from various diseases and receive extensive training to be able to offer constructive feedback to students after each role play. SPs are used in various programs, for example, *Emergency Room*, a program in emergency medicine, and the inter-disciplinary program, *Communication in Difficult Situations in Medicine*, as well as the psychosomatics program, *How to Communicate in Medicine*. Students can also practice different communication techniques (SPIKES-model) and social skills with the help of SPs in small groups. The programs involving SPs aim to prepare students of medicine during their internship for later contact with real patients during their clinical practice.

Mentoring Program

Students are supported during their course of studies by mentors and can opt for a student mentor in the first semester and for an academic mentor in the fourth semester. The aim of this program is the individual support and mentoring of students throughout the duration of their undergraduate curriculum. In the future, we are hoping to establish a mentored career tracking process starting from the period of undergraduate study through to professional training whereby a manual logbook system can structure any practical training. The Medical Faculty at Ulm was the first in Germany to develop a complete set of these log books for all medical specialties during the practical year at the end of medical training.

Curriculum of Integrative Medical Education & Training

Year	Study and Career Process						Logbook	Mentoring Program	Organizing Yourself
1	Beginning of studies						Preclinical studies	Care	Tutor – student
2									
3	Promotion (flexibility)						Clinical studies	Training	Teacher – student
4									
5									
6	Rotating Clerkships (Practical Year, PY)						PY	MD – student	
Final exams/Approbation									
7	Track 1: Education for medical specialist	Track 2: PhD Molecular Medicine	Track 3: PhD Psychosocial Medicine	Track 4: MBA in Medicine	Track 5: Postdoc program	Track 6: Training in management and leadership	Medical specialist	Postdoc – MD	
8									
9									
10									
11	<ul style="list-style-type: none"> • Medical specialist • Postdoctoral lecture qualification (Habilitation) • Leader / Manager 						Further education	Senior prof – postdoc	
12									
13	Research and teaching at University hospital	Networking with regional healthcare system	Starting a doctor’s practice	Leading position in hospital/medical center					
14									
15									

Medical education & training and career planning

Work-life Balance

Lifetime management and family life

Research in Medical Education at Ulm University

In order to enhance the quality of medical education, Ulm University also promotes medical education research. Research is needed to understand the learning process and to improve the effectiveness of instruction and thus the evidence of medical training programs. The medical education research report of 2009 presents research activities in response to the implementation of the new Medical Licensure Act 2002. A search of the Pubmed database and the archives of the journal of the German Association for Medical Education was conducted for this report and the institutions of the university were asked to submit their publications in the area of medical education. We found many articles, posters and presentations (152 in total) as well as dissertations, master theses and a *habilitation* thesis in various journals for this period. The major areas of medical education research at Ulm include curricular development, assessments and e-learning. The publications describe the development, implementation and evaluation of educational programs, methods and strategies. In the field of assessments, innovations such as the OSCE predominate. The construction, use and rating of e-learning tools, as well as the needs of students and teachers, have been discussed and, as a result of this medical education research report, we have concluded that a number of interesting and detailed projects are worthy of further development. Additional improvements to the quality of medical education research and the necessary facilities are also being planned. (This report in German can be downloaded at www.uni-ulm.de/fileadmin/website_uni_ulm/med/downloads/studium_lehre/Lehrforschungsbericht/Lehrforschungsbericht_HM.pdf)



Family-friendly Monitoring of Career and Family Planning

The Student Dean's Office has conducted a pilot study on family-friendly conditions in medical education in 2009 in order to determine the conditions and factors for a successful combination of medical education and having a family. The results show how support for parents who are studying can successfully be implemented by using the evidence to collect data based on the actual experiences and life situation of individual parents. This valuable information can help optimize the academic advice offered by advisors who will thus be equipped with a useful tool for assessing a student's study performance throughout the duration of a degree course. Such advice will consist of a strength-weakness analysis (SWOT) and a training contract with studying parents. The introduction of a "parent ID", or *smart card*, is being developed to make studying with children a matter of course at Ulm University.

Selected Publications:

- Liehardt H, Stolz K, Mörtl K, Prospero K, Niehues J, Fegert JM: Evidenzbasierte Beratung und Studien-verlaufsmonitoring für studierende Eltern in der Medizin. In: Zeitschrift für Beratung und Studium 2010;2:50-55.
- Thumser-Dauth K, Eichner B, Liehardt H, Fegert JM (2010): Elektronisches Beschwerde- und Ideenmanagement. In: Benz W, Kohler J, Landfried K (Hrsg.): Handbuch Qualität in Studium und Lehre. Raabe, Berlin. 27: 1-16.
- Fegert JM, Obertacke U, Resch F, Hilzenbecher M: (2009): Die Qualität der Lehre nicht dem Zufall überlassen. Deutsches Ärzteblatt. 106: 290-291.
- Böhm BO, Fegert JM, Liehardt H (2008): Neustrukturierung des Praktischen Jahres. Zufriedene Studierende in Ulm. Deutsches Ärzteblatt, 105: 1153-1154.

Dentistry

Global Commitment

The overall aim of the dental education at Ulm University is to produce dentists who are competent at providing patients with independent dental care based on scientific evidence and capable of adapting to the rapid changes in technology and new generations of dental products.

Strengthening of Clinical Skills and Competences

A complete revision of the lectures and seminars in preclinical dental subjects has shifted the teaching content from a focus on dental technician lab work towards training in clinically-related procedures. This process will be complete following a total overhaul and reorganization of the traditional preclinical courses into an interdisciplinary simulation clinic that will start to take place in 2011.

The teaching practice for the multi-speciality courses in restorative dentistry, endodontics, prosthodontics, and periodontology has gone through extensive renovation. It now houses 28 superior dental operatories where dental treatment is delivered by undergraduate dental students. A major characteristic of patient-related dental education is the continuous and ever increasing need to integrate new diagnostic tools and treatment options into the curriculum. In order to relieve students of the burden of meeting the high cost for new instruments, devices and materials, a proportion of the tuition fees has been made available as a fund to supply students with free instruments and materials, such as tray-organized dental instruments for clinical courses, dental working models, model teeth for cavity and crown preparation, and rotary nickel-titanium instruments for root canal preparation.

Recently, patient-based teaching has also been implemented in orthodontics.

A multi-step program, starting with a two-day exploration of the clinical environment during the second year and ending with a clinical traineeship after the third year, has been designed in order to achieve a gentler transition from pre-clinical phantom courses to the treatment of real patients by dental students in the teaching clinic. Activities in the near future will concentrate on the further development of interdisciplinary clinical courses.

Teaching of Modern Treatment Concepts

Clinical teaching covers both proven state-of-the-art methods as well as innovative diagnostic treatment options that include digital radiography, adhesive tooth-colored restorations, full ceramic restorations, non-destructive cavity preparation, root-canal preparation with rotating instruments and implant-based oral rehabilitation. The focus is on etiology-related treatment strategies and minimal invasion. The teaching of modern clinical concepts is supported by the increasing use of the medical faculty's web-based teaching platform MOODLE which offers students the opportunity both to download Powerpoint slides, videos and online self-evaluation tests, and to communicate directly in the "news group".



Caring for Students

Great efforts have been made to improve the mentoring and care of students. The dental school's Teaching Coordinator employed since 2007 has become an essential and indispensable contact for the students as documented by a repeatedly high and positive evaluation. The functions of the Teaching Coordinator are performed in close cooperation with the Dean of Students and the Student's Office, and cover a wide range of services that includes communication with licensing authorities and examination boards, updating and management of timetables, course guidance and counseling, management of the teaching platform MOODLE, registration, teaching evaluation, lecture hall management, surveys among the students, management of teaching assignments, equivalence confirmations and letters of recommendation.

At the end of each semester, students regularly express their appreciation of the high level of care and mentoring in their evaluation of the teaching being carried out in all courses. Individual supervision and care is promoted as a result of the relatively small group size of 28 students per semester.



Molecular Medicine: Bachelor, Master and PhD Programs

Significance of Molecular Medicine

Scientists working in the field of Molecular Medicine analyze the molecular mechanisms of the origin of diseases with the long-term goal of developing innovative diagnostic and therapeutic concepts and strategies. Their experimental findings are highly relevant for society since cardiovascular diseases, cancer and metabolic disorders, to name but a few, are deemed to be the major causes of death worldwide. Moreover, dementia, such as Alzheimer's disease and other diseases linked to aging, will increase the costs for our health systems dramatically, especially in view of the dramatic demographic changes in population structure. Because of the significance of Molecular Medicine for modern society, the need to provide highly trained scientists will be of immense relevance for the future.

Bachelor of Science Program

The Bachelor of Science Program lasts 6 semesters and ends with the completion of a thesis in the final semester. The Program combines the topics and questions of experimental medicine with the methods of molecular and cell biology, and genomics. In the first two semesters, the main educational emphasis is placed on the physiology and pathophysiology of cells and organs based on an intensive mathematical and natural science approach. The program consists of modules which include anatomy, biochemistry, bioinformatics, developmental biology, gene therapy, human genetics, immunology, microbiology and virology, oncology, pathology, pharmacology and toxicology, and physiology.



The Bachelor's program starts in the winter semester and offers 50 study places. Applicants are chosen on the basis of their results at undergraduate level. Good marks in the natural sciences, Mathematics and English will increase the chances of obtaining a study place. About 900 persons apply for this program each year.

Master of Science Program

The Master of Science program lasts 3 semesters and ends with the completion of a thesis in the final semester. In the first year of study, the core element of the master's course focuses on practical research training (lab rotations) to allow students to concentrate on current research topics and modern scientific methods. Topics include hematology and oncology, human genetics, infectious diseases and immune reactions, neurobiology and regenerative medicine. Soft skills subjects, such as good scientific practice, bioethics, project management and patent law, are also included.

The program starts either in the summer or winter semesters and offers 25 study places. Applicants are chosen by a selection test and by attending interviews. The program has more than 100 applicants each year.

Fast Track Promotion opportunity

Highly motivated and talented students have the opportunity to enter directly into the three-year doctoral phase within the International PhD-program after successfully passing the first year's examination of the Master's program. Such an opportunity makes the Master's program a highly attractive option for outstanding students.

PhD Program

Based on the results of a biomedical master's course of studies, the aim of the PhD course is to train postgraduates by means of a structured program to allow them to carry out scientific research independently and on their own initiative in the field of molecular medicine. Successful completion of the PhD program results in being awarded the degree of Doctor of Philosophy (PhD) or Dr. *rerum naturalium* (Dr. rer. nat.).

The PhD program is internationally-oriented and conducted in English. The central element is the three-year doctoral dissertation at the end of which the student must defend his/her research results in open disputation before a scientific committee. Each doctoral student is supervised by a three-member supervisory team. Apart from laboratory work, doctoral students must attend compulsory courses. These include, for example, the lecture series *Improve your Textbook Knowledge*, practical laboratory training courses and a seminar series such as a Journal Club or Progress Report. A large variety of Key Competence Seminars are also offered on a voluntary basis.

The PhD program is an integral part of the International Graduate School in Molecular Medicine Ulm which is funded by the Excellence Initiative of the German federal and state governments (see also page 34).

Proven quality

The Bachelor, Master and PhD programs have each been successfully accredited by the *Central Evaluation and Accreditation Agency Hannover* (Zentrale Evaluations- und Akkreditierungsagentur Hannover). This accreditation attests to the high scientific and educational quality of all three programs.