

# **HealthTEC Innovation Design - a proposal for a novel Master degree program based on Unmet Clinical Need, global Healthcare Challenges, and 21st century skills**

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## **Introduction**

The effectiveness, efficiency, availability, agility, and equality of global healthcare systems are in question. The COVID-19 pandemic have further highlighted some of these issues and also shown that healthcare provision is in many parts of the world paternalistic, nimble, and often governed too extensively by revenue and profit motivations.

The 4th industrial revolution - the machine learning age - with data gathering, analysis, optimisation, and delivery changes has not yet reached Healthcare / Health provision. We are still treating patients when they are sick rather than to use advanced sensors, data analytics, machine learning, genetic information, and other exponential technologies to prevent people from becoming patients or to help and support a clinicians decision.

## **Results and Conclusion**

We are trying to optimise and improve traditional medicine (incremental innovation) rather than to use technologies to find new medical and clinical approaches (disruptive innovation). Education of future stakeholders from the clinical and from the technology side has not been updated to Health 4.0 demands and the needed 21st century skills.

The paper presents a novel proposal for a university and innovation lab based interdisciplinary Master of Research education of HealthTEC innovation designers that goes over a one year period with 450 hours of teaching plus 2 identified research projects for Unmet Clinical Needs.

# How do we need to adapt Biomedical Engineering Education for the Health 4.0 challenges?

## Proposal for novel HealthTechnology teaching focused on applied Innovation Generation

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### Introduction

Challenges of the future pose new requirements on the education and skills of future medical technology engineers. This implies a broad range of skills-development including: team work, communication, coaching, project management, learn how to learn, visionary thinking, management and leadership. But above all, the empathy towards the clinical user and patients as well as a basic understanding of clinical workflows has to be implemented.

### Methods

For the innovation process, only through this understanding, an idea can be turned into a product or service that creates value. Even though techniques for the development of innovation and enhancing creativity in individuals are widely discussed, there are relatively few reports on the practice of mainstreaming creativity in an organizational setting.

### Results

The Graduate School “Technology Innovation in Therapy and Imaging (T<sup>2</sup>I<sup>2</sup>)” wants to counteract these problems with a structured post graduate program and focuses on an interdisciplinary and application-oriented education. The educational process starts with the observation and identification of clinical needs and covers all steps to transfer solutions into valuable products.

### Conclusion

The aim of the graduate school is to bridge the gap between medicine and technology for products and services that have a clearly identified need. Students need to work more intimately with the medical users to gain a better understanding of their needs. This would result in identifying much more useful equipment for the healthcare professionals. The school will also focus on the innovative and entrepreneurial aspect of healthcare and teach students to make those innovations marketable.

## **Public domain „Unmet Clinical Need“ Database derived from a dedicated Bio-Medical Engineering Innovation Generation Lecture**

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### **Introduction**

UNMET CLINICAL NEEDS are the basis for future product and service opportunities in the biomedical engineering domain. The university lecture (5 ECTS) „Image Guided Surgeries“ loosely based on the Biodesign approach from Stanford University teaches students to “go out, see, and innovate“. As part of the lecture students had to access the surgical environment and experience several live interventions within interdisciplinary groups. More than 70 unmet clinical needs were subsequently identified and some of them subsequently used for innovation projects. We wanted to make these identified needs available for everyone and fed them in to a database with relevant search and display functions and a webpage interface to make them broadly available.

### **Methods**

In the lecture and seminar, the students initially learned the basics of image guided surgeries combined with innovation generation and development techniques and basics of healthcare economics. Small teams were formed (max. 4 team members) to observe and analyze actual surgical interventions with the goal to identify workflow, medical and other innovation needs and to subsequently evaluate the findings and work on a prototype solution. This resulted in numerous identified clinical needs and project ideas.

### **Results**

The needs/ project ideas were clustered, judged and evaluated based on several parameters (feasibility, impact, cost...). Each project idea was then fed into the database with a problem statement. There is free access to this database and a search function for the desired project with a specific region of interest (department, intervention, equipment) and image modality. The clinical needs are cataloged and made available to everyone. Different actors can access these needs and business ideas and thus create added value from this study.

### **Conclusion**

Different user perspectives were evaluated to check how they can use these unmet clinical needs to make innovation projects with commercial value. These results are recorded in the database and made accessible. This not only creates a great opportunity for various interest groups such as industry, hospitals and research institutes to strengthen development, but also exchanges valuable clinical and technical knowledge with one another.

# From whole-day face-to-face instructor-led seminars with group work to successful instructor-led distance-learning alternatives

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## Introduction

Driving digitisation, reaching an audience spread over different places and reduction of travel costs are reasons to change the delivery mode of face-to-face seminars and trainings to distance-learning alternatives. The need of social distancing makes it more urgent and even whole-day seminars with group work elements which are part of university programs are transferred to digital delivery. The conditions of face-to-face instruction differ essentially from the conditions of distance-learning instruction. This work clarifies what is necessary to make the transfer successful. As example a whole-day face-to-face instructor-led introduction to Medical Device Regulation with group work elements is used.

## Methods

Didactic methods and materials of the existing seminar are examined and possible settings including tools for the distance-learning alternatives are discussed. These lead to methods and materials that can be used in the new setting. Additionally, other conditions like the sequence of instruction and breaks or the familiarity of the participants with the used tool are questioned. Dependent on the possibilities of the didactic methods and material in the new setting and the time frame the learning objectives are verified and adapted if necessary.

## Results

For the example seminar used here, a virtual class with instructors and participants meeting at the same time in a virtual classroom that has offers the possibility of breakout rooms is chosen. The whole-day (eight hours incl. breaks) seminar is split into two parts of four hours incl. breaks delivered on two different days. The classroom methods are transferred to the virtual classroom, e.g. the use of a pin board is replaced by the use of a whiteboard.

If the conditions of the virtual classroom are considered carefully the face-to-face seminar can be transferred successfully.