Pedagogic case and specific course in which designed tasks and units are used

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Pedagogic case:	• Inquiry-based introduction into System Biology for 1st year biomedical students
Description (including temporal scheme for design, development and implementation)	• 1st year biomedical students learn basic mathematics, and in particular about mathematical models of growth, chemical kinetics and dynamical systems of proteins. • Computer simulations will be used to let student explore biomedical examples of processes of change and to let them find out how mathematics can help understand the nature of equilibria • Rough planning: design in October 2018, development November-December 2018, implementation January-February 2019

Aim of pedagogic case	• Let students learn mathematical concepts and fundamental methods relevant for a mathematical view on processes of change in a biomedical context:
	  ○ basics of chemical kinetics and pharmacokinetics
	  ○ modelling of microbial growth and of cell growth (gene regulation)

Mathematical concepts	• Basic concepts of dynamic systems:
	  ○ basic concept of ODE and systems of ODEs (e.g. line element fields, numerical solutions),
	  ○ analyzing solutions (stationary points and the nature of these points)
	  ○ standard models (exponential, restricted, and logistic growth, Michaelis-Menten kinetics)

Addressed practice	• 1st year of the bachelor programme in biomedical sciences. This is a new course in the study programme of 2018-2019
Place in specific course Course name Place of teaching units	• The course is called Basic Statistics and Basic Mathematics for Biomedical Sciences • Teaching units will be used in the mathematics part of the course, at least the last 4 course weeks (in February 2019, when students already know more about the cell dynamics), but preferably also in two course weeks in January 2019 when students learn about microbial growth
Learners profile orientation, year, age, prior knowledge, other such as math anxiety, special needs, ..	• Biomedical students • First year students • High school mathematics background (Math A or B) • Mathematical content is new to all students • Mathematics is not an attractive subject for a large number of students and many want to see applications
Organisation of specific course study credits/hours, location, group size	• 8 credit course: 2 EC for mathematics part, 6 EC for Statistics part (which is also meant to be inquiry-oriented according to the co-teacher) • Course runs on weekly basis from September 2019 up to and including March 2020 as obligatory course: mathematics part takes 9 course weeks in total • Number of students: 130
Expected learning outcomes	• Student will learn to model, simulate and analyse simple processes of change. • They will use and implement themselves computer models to explore behaviour of dynamic system

Envisioned use of digital technology	• SOWISO environment for interactive course notes and digital practice tasks with online feedback • R-studio environment for inquiring dynamic systems via simulations
Planning of tasks	• Finishing the creation of the course team • Looking at introductory texts of System Biology • Learning R-studio • Making a rough design of the mathematics part of the course • Discussing opportunities for student inquiry within the developers group • Discussing the design with the bachelor programme director and the coordinator of the learning track to which the course belongs • Starting to create mathematical tasks • Discussing the first draft within the developers team • Discussing opportunities to make the lectures more interactive and inquiry-oriented, and the roles of the mathematical tasks herein • Finishing the first version of the tasks and the lecture notes • Setting up the communication with the students • Drafting the questionnaire about the mathematics part of the course
Names of persons involved	• André Heck • Marthe Schut • Student assistant in the mathematics part of the course
Course:	Basic Statistics and Basis Mathematics in Biomedical Sciences
Learning objectives	Students learn • to apply basic mathematics to model, simulate and analyse simple processes of change • to read and write mathematics at a basic level relevant for the biomedical context • basics concepts and methods of dynamical systems in the context of System Biology
Learning contents	• basic mathematical functions most relevant in biomedical context: exp, log • mathematics of change: derivatives, ODE, system of ODEs • basic growth models: exponential, restricted growth, logistic growth • chemical kinetics and pharmacokinetics • introduction to dynamic system

	• simple models of gene regulation
teaching /learning activities	• Course week consists of one 2-hours lecture; one 2-hours tutorial session; plus 2 hours digitally supported self-study
Media	• Online: SOWISO and Canvas ELO • Students use their own computer to use and implement computer models
Evaluation	• Standard course evaluation + questionnaires made by lecturers + analysis of the use of SOWISO by students
Instructor role	• developing course contents • in lectures discussing the broad picture with the students, focussing on mathematical concepts and appliation of them in biomedical context • working together with instructors involved in the tutorials
Student roles	• active participation in the lectures • learning about mathematical models and modelling in a hands-on/brains-on tutorial session • practising basic mathematical methods in computer-based tasks with online feedback in self-study time