Crossing Borders:
Peer to Peer Education in Mechatronics

1st Multiplier Event

Storytelling: Experiences of P2P learning

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Initial Situation - Overview

- Master degree program:
  Mechanical engineering / Mechatronics (M.Eng)

- Lecture:
  System level rapid development in mechatronics (10 ECTS)

- Goal:
  Familiarizing students with methods and tools for rapid system development using an integrated approach from simulation up to functional hardware (Matlab/Simulink and robot h/w)

- Participants:
  Typically six to twelve students, working in teams of 3-4 students
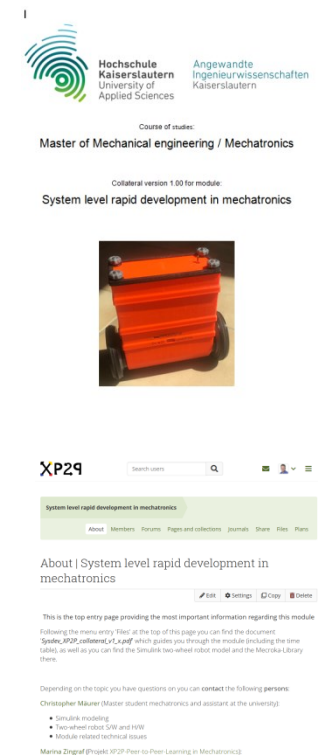
Initial Situation - Workflow

- First half of semester (about 6 weeks):
  **Introduction into relevant topics
  One topic per week - split into: Lecture, tutorials,
  exercises**

- Second half of semester:
  **Solving different predefined challenges by improving a
  basic system (self balancing robot) including
  simulation models and a roughly working hardware**

- Assessment:
  **Intermediate presentations (every 2 weeks) during the
  second half of semester and a final presentation
  (presentations in groups but every student has to do a
  part of the presentation)**

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XP2P
Initial changes in the setup of the course

- Lectures, tutorials and exercises are replaced by a collateral (~ 50 pages) guiding the students through the process of acquiring the knowledge needed to master challenges and solve the tasks

- Usually every group has one robot to work with.
  Due to the pandemic each student is provided a real robot

- The assistant in mechatronics is the first place to go for **all** open issues regarding the technical aspects of the course

- Mahara (as ePortfolio & LMS platform) is the medium the students have to present their results with (at given milestones)

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Setup at start of the course

- **Students**

  - 12 Students registered for this module

  - 2 Students cancelled participation before module started

  - 10 Students participated in three groups (4 / 4 / 2)

  - 2 out of 10 Students participated from India due to the pandemic

- **Assistant B.Eng. Christopher Mäurer** (50% master student, 50% assistant)

  - Responsible for helping students regarding h/w and s/w issues

- **M.A. Marina Zingraf**

  - Responsible for helping students in setting up the ePortfolio in Mahara

- **Fixed Zoom-Meetings** scheduled for asking questions every 2 weeks

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Timeline - Milestones/Reflections

Start of lectures in
WS 2020/2021:

Sept. 28th 2020

Last lectures:

Feb. 6th, 2021

TITLE	COMPLETION DATE	DESCRIPTION
Entry Reflection	26 Oct 2020	Introduction/ exposé: Presentation, delimitation & justification of the choice of topic. Forecast of the portfolio. Tags: e-portfolio, Reflections
M1 Reflection	9 Nov 2020	Reflection on Software setup, Simscape modelling and control design Tags: e-portfolio, Reflections
M2 Reflection	7 Dec 2020	Reflection on setting up and testing the two-wheeled robot Tags: e-portfolio, Reflections
M3 Reflection	18 Jan 2021	This reflection is about the tasks to master. The learning process and necessary changes done to the model will be listed. Tags: e-portfolio, Reflections
Closing Reflection	6 Feb 2021	Conclusion: detailed portfolio closing, review & outlook Tags: e-portfolio, Reflections

XP2P
Some experiences during the semester

- The qualification at the beginning was widely spread (as usual) from no programming and/or Matlab experience up to experienced students; the progress regarding the development of competences overall was (surprisingly) good

- About 80% of the students were highly motivated and dedicated to the course (just a subjective perception in regard to the reflections)

- Development of competences shifted from digging into deep technical details to self-regulated acquirement of information and knowledge using typical contemporary media (e.g. Mathworks material (video, tutorials), Youtube and forums, …)

- It's not easy to send a university build robot to India

XP2P Assessment

- For the teacher the direct personal impression is missing

- Inputs are

  - the reflections/ePortfolios

  - some comments of the assistant about his experience with different students

- At the end every student got 3 other ePortfolios to comment on

- 100% objective assessment is difficult

XP2P
Student feedback

- Overall the feedback was very positive regarding the learning curve, the general setup and the way of working in small groups on the same topic

- Some minor negative remarks arose regarding

  - The written execution of the reflections in Mahara

  - Working in different time zones (Europe, India)

Remark:

However it's hard to generalize this feedback since the 'home office style' setup was quite typical due to the pandemic.

Will be interesting in the future when students do P2P learning in presence

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XP2P
Conclusion

- P2P learning works very well, if

  - Students are already on a higher technical level and are motivated

  - Students have good communication skills

  - there is a intermediate level contact person with good technical skills

- The intermediate milestones (reflections) could be complemented by presentations to make it easier for the teacher to ask questions to get instantaneous feedback. This eases e.g. the individual assessment and the discussion of some technical details

- Smart students with good social skills but less technical competences might have a greater chance to get through such a module compared to a module with a traditional written examination (like it can be in real business life too)