Enhanced Food Chemistry Lab: interactive, social and virtual

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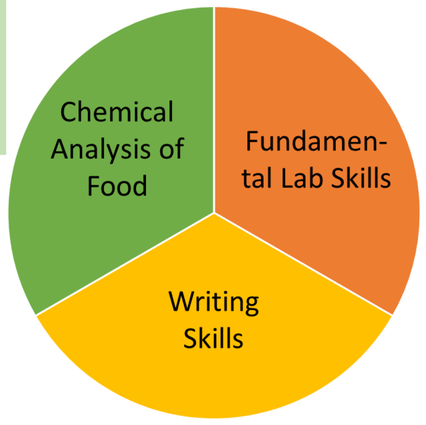
Introduction & Teaching Concept

- Know and apply methods
- UV-Vis spectroscopy
- Chromatography (TLC, HPLC, GC)
- Titration
- Enzymology
- Kjeldahl



- Learn and apply skills
- Lab safety
- Selection of correct/appropriate/ reasonable equipment for an experiment to ensure quality of results
- Waste management

- Aquire and apply skills
- Lab journals
- Lab reports

Learning objectives in the Food Chemistry Lab course (4th semester, Food Science Bachelor)

We want to achieve…

1)…a better instruction of the basics (security, handling, reports)
2)…widen the experience with important experiments that cannot be conducted physically in the lab with all students (Kjeldahl, LC/MS)
3)…collaboration (and critical thinking) among students
4)…a stronger attractiveness for the students

Interventions

- **TORQUE format**
- **virtual labs**
- **interactive videos**
- **instant lab reports**
- **peer-review process**

Analysis of Student Learning

Report Writing

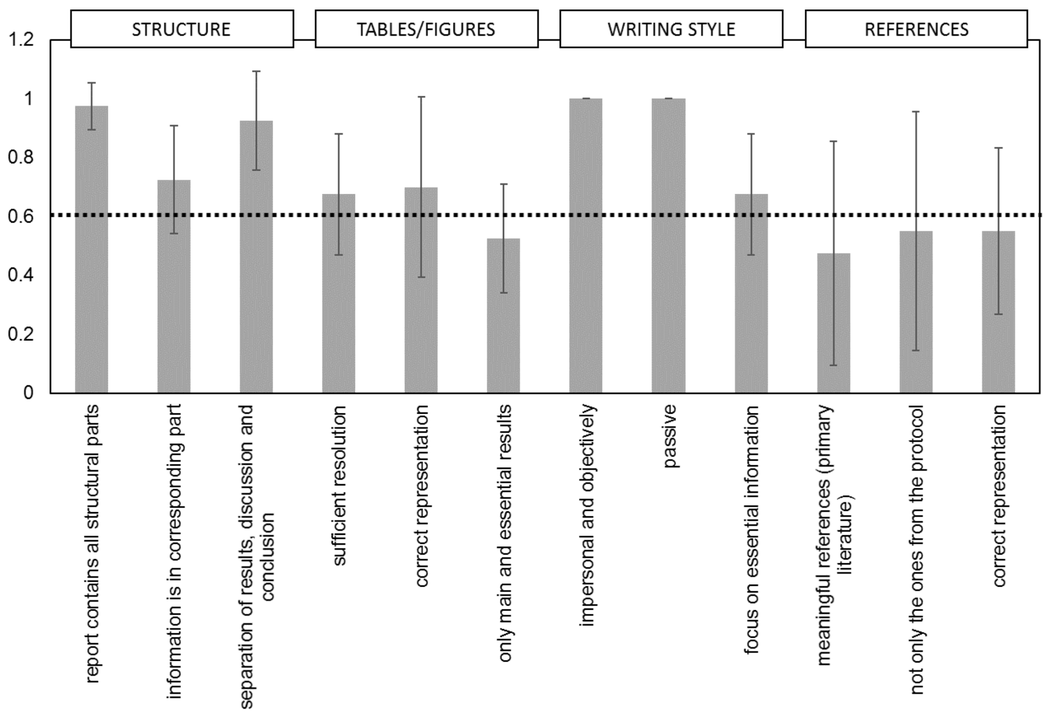


Figure 1. Results of the document analysis of ten final reports. For each quality criteria students could get one point each (1 = good, 0.5 = sufficient, 0 = insufficient). Shown are mean values with standard deviations. Values below 0.6 were considered as problematic.

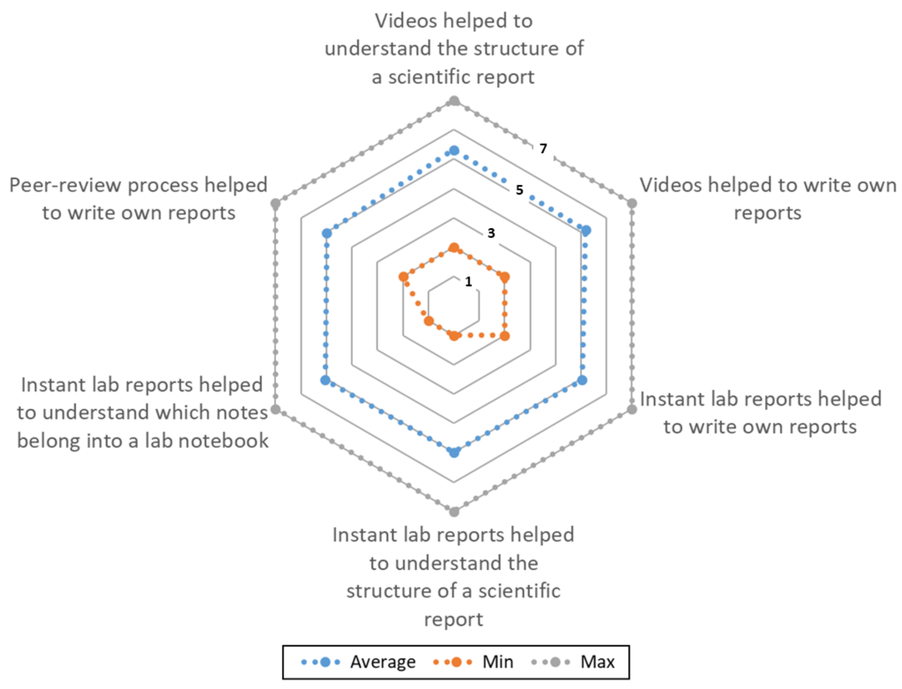


Figure 2. Evaluation of the questionnaire given to the students at the end of the semester (n=57). Students had to evaluate statements regarding the three intervenetions (1 = not true at all; 7 = totally true). Mean values are shown in blue, grey symbols are maximum values and orange symbols are minimum values given by the students.

Virtual Labs

At the end of the semester, students were asked to complete a questionnaire about their use and their general satisfaction of the virtual labs.

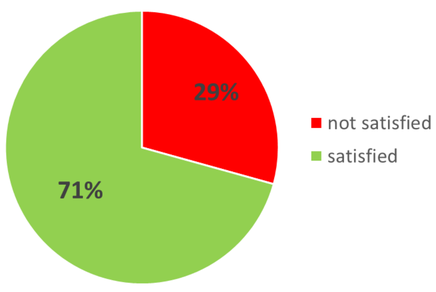


Figure 3. General satisfaction with the virtual labs (n=58).

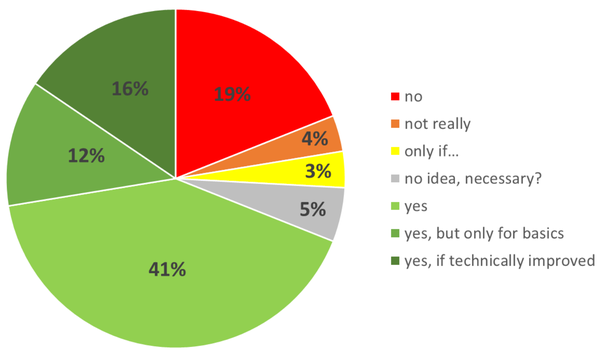


Figure 4. Answers of students to the question if ETH should use more virtual labs (n=58).

Kjeldahl Lab

With our new Kjeldahl Labster lab (virtual lab), we did a small experimental study. We wanted to know how well students would perform in comparison to a demonstration in the lab (physical lab). Our hypothesis was that both groups would perform the same.
The demonstration took up to 60 minutes in the physical lab. For the virtual lab, students spent, on average, 50 minutes playing through.
At the end, students were tested with the same Moodle quiz with 13 questions (multiple choice and short answers).

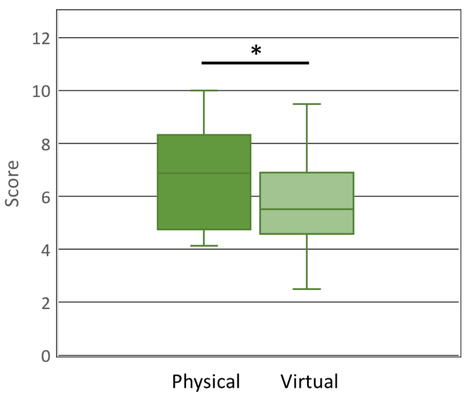


*Figure 5. Achieved points in the quiz (for each correct answer students got 1 point, max.13 points; * p-value < 0.05).*

Conclusion & Outlook

- Introduced interventions clearly improved the overall quality of laboratory reports. Consequently, the time needed by the teaching assistants to correct the reports was considerably reduced.
- Most of the students are confident that they could transfer what they have learned from the virtual to the real space.
- A majority of the students think that virtual labs should be used more at ETH.

Acknowledgement

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