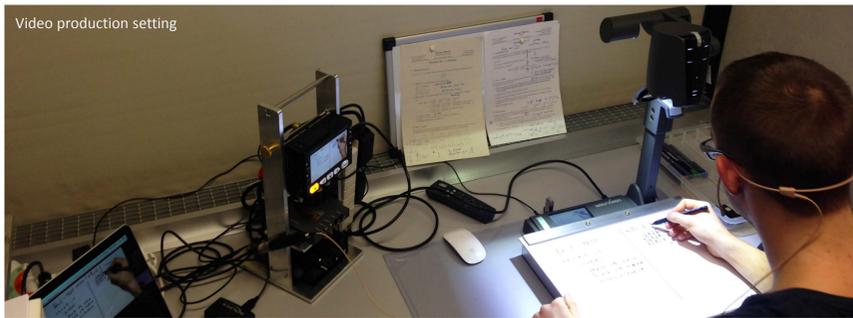


## Setting and Method

Based on a pilot project carried out in 2013, the Department of Physics at ETH Zurich now is providing equipment and space, where lecturers can produce tutorial videos in high quality at their own pace. The production is limited to the "Writing Hand" format (Lovisach, 2014), which we consider being most efficient for our learning objectives.



In this study we want to gain insights on how students are actually taking advantage of the videos during their learning process.

For this purpose we analyzed data provided by a physics introductory lecture. Each week during the 13 week lecture period (September to December) one video tutorial was provided to the students as an optional learning aid for the topics covered during this week. A total of 26 (2x13) video tutorials has been used for the study.

The assessment is restricted to a final exam taking place at the end of January. Usually the exam consists of problems comparable to those that are covered by the tutorial videos.

Students had no obligation to use the videos and they were free to decide, when and how to make usage of them.

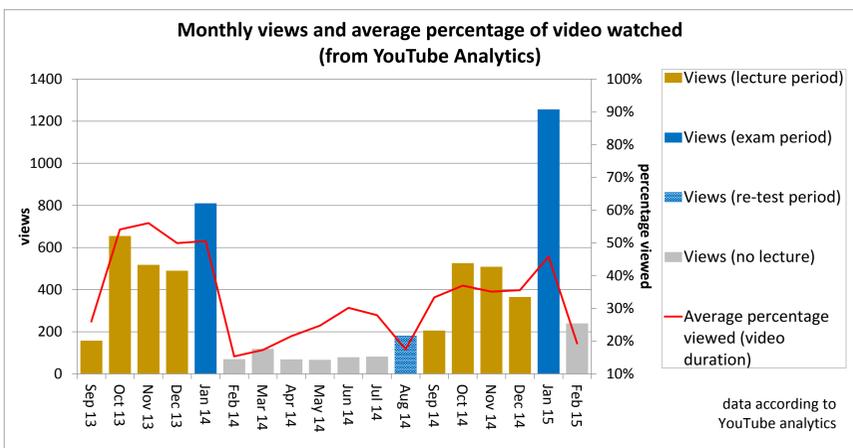
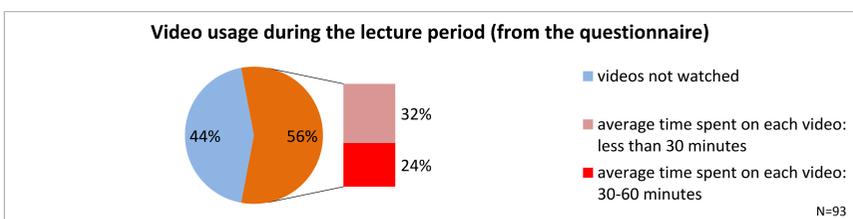
For the study we consider data coming from two different sources:

- Data provided by YouTube analytics
- Data provided by a questionnaire

## Results

56% of the students have been extensively watching the videos during the lecture periods (400-600 monthly views).

This recurrent lecture has been offered in autumn 2013 and in autumn 2014 with 200 resp. 203 students.



## References

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## Discussion

Almost all of those students, not having used the videos, claimed that they were lacking time for this task. A great fraction, however, stated that they will surely use the videos for their exam preparation. The high peaks of views during the preparation period confirm this intend

24% of the students have been spending much more time on each video than its actual playing length from which 81% reported that they have been using additional material (script, notes, etc.) while watching the videos. 96% of the students agreed that the videos supported them in understanding the subject. To a great extend, students have been using the video tutorials, even though there was no obligation to do so.

The weekly submitted video tutorials were viewed evenly during both lecture periods. The lower number in September results from the fact that the term starts in mid-September and the first tutorial was available only at the end of the month. High peaks during the exam period show evidence that students extensively used the videos for preparation.

The average length of each video watched varies from 2013 to 2014. This might result in the different video sets used in both lecture courses. However, the video chunks watched during a playback still show high proportions, around 50% in 2013 and around 35% in 2014.

According to YouTube these values reflect a high degree of engagement. The low rate during the re-test period may result from the fact, that the re-test took place in early August 2013. Only few students sat this exam, which results in low views during the summer. With an average video length of 15-25 minutes, students have watched a substantial chunk of video during each playback, which again gives evidence that they have been working with the videos and not only consuming them.



## Conclusion

Three major conclusions may be drawn from our study:

- Most students used the video tutorials in a way to support their understanding by showing high engagement. Compared to former lectures without video tutorials, however, we could not find any significant improvement in the exam grades. The impact of different cohorts might be too strong.
- Students used the tutorials during the lecture period in the process of knowledge acquisition and during the exam preparation for knowledge consolidation. It is important to keep both usage modes in mind when designing educational videos.
- Even though YouTube Analytics is primarily focusing on merchandising needs, it also provides suitable metrics to perform learning analytics.

To sum up, videos showing detailed solutions to physics problems are highly appreciated by students, especially by engineering students who do not primarily have an interest in a comprehensive theoretical background.

By now we have started to produce similar tutorials for our graduate physics students, where we focus on the application of theoretical concepts in different contexts. Preliminary student feedback on the usage of these videos suggests comparable results to our study.

## Acknowledgments

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