

# Experiences from a calculus class on using videos with interactive elements

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## ABSTRACT

*Keywords* – flipped learning, calculus, videos

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## I Background

Calculus is a central part of the engineering educations at the University of Southern Denmark and many students find the calculus course challenging. During a calculus class in fall 2016, I experimented with using videos as part of the students preparation for lectures, as part of a flipped classroom. The videos focused on doing worked examples. In addition most of the videos were augmented with mini quizzes. In the mini quizzes students were encouraged to complete intermediate calculations at certain moments in the video.

## II Explanation

The focus on worked examples in the videos, is based on my wish to build a scaffold for the students, to which they can relate new information they get from their textbook and the lecture. By providing a scaffold through a worked example, the students become aware of the terminology of the topic and have seen some of the central operations related to the topic. In addition the videos provide concrete examples of the subject that will be dealt with in the lecture, which is an effective study method according to (Rawson 2015). The addition of interactive elements to videos, is expected to change the video viewing experience from a passive viewing experience to an active viewing / calculating experience when interacting with the videos. Through this change of the videos, the learning outcome of the videos is expected to raise, as videos without mini quizzes often target the two lowest layers (remembering and understanding) in Blooms taxonomy, but videos with mini quizzes targets the third and fourth layer (applying and analyzing) in Blooms taxonomy (Krathwohl 2002).

## III Set-up

Prior to each lecture the students were given a “weekly note” as a pdf file. On the weekly note there were suggestions for different activities that could prepare the students for the lecture. The activities were to watch one or more videos and some reading in the textbook. The videos were mentioned before the textbook to encourage the students to first watch a video and then read in the textbook. The videos were focused on problem solving (e.g. solve three linear equations with three unknowns) and not directly on introducing new theory. The intention were to let the students become familiar with the methods before digging deeper into the theory. In addition most of the videos were augmented with mini quizzes, where students were asked to answer two different types of questions. Either they had to calculate some intermediate results required for solving the current case problem or they had to choose a suitable strategy (from a list of possible strategies) for a certain problem. In practice the videos were added to a course on <http://tekvideo.sdu.dk> and then augmented with the mini quizzes. The augmentation consisted of adding question boxes to show at certain timestamps when playing the video. To follow up on the intervention, students answered a questionnaire about the usage of videos as part of the calculus course.

#### **IV Results**

The students highly appreciate the use of videos for their preparations and states that it helps them learn calculus. Some mention that it becomes easier to understand the textbook after having seen a video of a worked example. The use of mini quizzes in the videos shows that many students use them actively to test their knowledge. The number of views for each video that was included in the weekly notes were roughly viewed 1.5 time for each active student in the class. About 50% of the posed questions in the videos were answered.

#### **REFERENCES**

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